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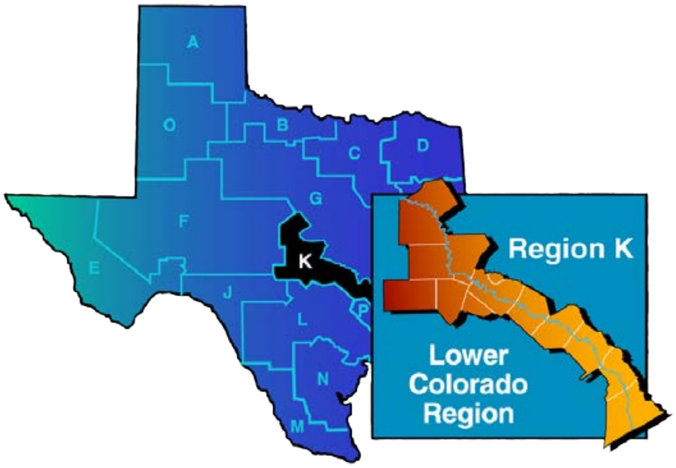

DRAFT

Initially Prepared

2021 Region K Water Plan

for the Lower Colorado Regional Water Planning Group

Volume 2 of 2
(Chapter 5 through Chapter 11)

prepared by
Lower Colorado Regional
Water Planning Group

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ABBREVIATIONS USED IN THE REPORT

ac-ft/yr	Acre-Feet per Year
cfs	Cubic Feet per Second
DOR	Drought of Record
GAM	Groundwater Availability Model
GCD	Groundwater Conservation District
GMA	Groundwater Management Area
GPCD	Gallons Per Capita Daily
GPM	Gallons Per Minute
LCRA	Lower Colorado River Authority
LCRWPA	Lower Colorado Regional Water Planning Area
LCRWPG	Lower Colorado Regional Water Planning Group
MAG	Modeled Available Groundwater
MGD	Million Gallons per Day
MWP	Major Water Provider
nPF	Not Potentially Feasible
PF	Potentially Feasible
ROR	Run-of-River
RWPG	Regional Water Planning Group
SWP	State Water Plan
TCEQ	Texas Commission on Environmental Quality
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
WAM	Water Availability Model
WMS	Water Management Strategy
WRAP	Water Rights Analysis Package
WUG	Water User Group
WWP	Wholesale Water Provider

WATER MEASUREMENTS

Acre-foot (ac-ft) = 43,560 cubic feet = 325,851 gallons
Acre-foot per year (ac-ft/yr) = 325,851 gallons per year = 893 gallons per day
Gallon per minute (gpm) = 1,440 gallons per day = 1.6 ac-ft/yr
Million gallons per day (MGD) = 1,000,000 gallons per day = 1,120 ac-ft/yr

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	Drought Management	*5.2.4.9.1*
Goforth SUD*	Drought Management	*5.2.4.9.2*
Kempner WSC*	Municipal Conservation	*5.2.2.3*
	Drought Management	*5.2.4.9.1*
Leander*	Drought Management	*5.2.4.9.1*
	LCRA Contract Amendments	*5.2.3.1.4*
Lee County WSC*	Drought Management	*5.2.4.9.1*
Polonia WSC*	Drought Management	*5.2.4.9.1*
Round Rock*	Municipal Conservation	*5.2.2.3*
	Drought Management	*5.2.4.9.1*
West End WSC*	Drought Management	*5.2.4.9.1*
Williamson County WSID 3*	Drought Management	*5.2.4.9.1*
Williamson Travis Counties MUD 1*	Drought Management	*5.2.4.9.1*
Zephyr WSC*	Drought Management	*5.2.4.9.1*

* Region K is not the primary region for this WUG.

CHAPTER 5.0: IDENTIFICATION, EVALUATION, AND SELECTION OF WATER MANAGEMENT STRATEGIES BASED ON NEED

Chapter 4 identified the WUGs in the region with water needs. *Appendix 4A* lists all WUGs within Region K with shortages. This chapter (*Chapter 5*) describes the analysis regarding the identification, evaluation, and selection of appropriate water management strategies for the Region K. Water management strategies have been defined for each of the identified future water shortages within Region K as required by the regional water planning process. Included within this chapter are:

- Description of the potentially feasible water management strategies
- Definition of the recommended and alternative water management strategies
- Allocation of selected strategies to specific WUGs

In addition to the above, this chapter has a sub-section specifically to address water conservation, including any recommended water conservation management strategies.

5.1 POTENTIAL WATER MANAGEMENT STRATEGIES

Region K presented their process for identifying potential water management strategies for public comment at the April 11, 2018 Region K meeting.

TWDB regional water planning guidelines provide a list of potentially feasible water management strategies that should include, but is not limited to:

- Expanded use of existing supplies.
- New supply development.
- Conservation and drought management measures.
- Reuse of wastewater.
- Interbasin transfers.
- Emergency transfers.

The Region K process that was used to identify potentially feasible water management strategies for the region includes the following:

1. Define groupings or common areas with supply deficiencies.
2. Develop a comprehensive list of potentially feasible strategies for each area.
    - Recommended and alternative strategies from 2016 Region K Water Plan
    - Strategies documented in local plans
    - Suggestions from the public
3. Meet with potential suppliers/WUGs for each area to determine current strategies under consideration.
4. Prepare qualitative rating based on cost, reliability, environmental impact, and political acceptability for the various strategies.
5. Select one or more additional strategies for each area, if appropriate.
6. Present proposed shortlist at Public Meeting during Region K Planning Group meeting for modification and/or approval.

The complete list of potentially feasible water management strategies considered in the 2021 RWP are included in *Appendix 5A*. *Appendix 5A* also includes a table that identifies whether each category of water management strategy required for consideration by TWDB is potentially feasible or is not potentially feasible for each Water User Group (WUG) with water needs.

5.2 RECOMMENDED WATER MANAGEMENT STRATEGIES

The primary emphasis of the regional water planning effort is the development of regional water management strategies sufficient to meet the projected needs of WUGs throughout the state. Water needs are determined by comparing user group water demands to the water supplies available to that user group. The following sections present information concerning the identification, evaluation, and selection of specific water management strategies to meet specific projected water supply shortages for the LCRWPA (Region K). If a project sponsor wishes to be considered for certain types of State funding, the project that the funding is requested for must be included in the Regional and State Water Plan. It should be noted that local plans that are not inconsistent with the regional water supply plan are also eligible to apply for certain types of TWDB financial assistance to implement those local plans even though they have not been specifically recommended in this plan.

The identified water needs presented in *Chapter 4* are based on Modeled Available Groundwater (MAG) volumes and conservative surface water availability estimates, which assume only water available during a repeat of the worst Drought of Record (DOR), that all water rights are being fully and simultaneously utilized, and exclude water available from LCRA on an interruptible basis and water available as a result of municipal return flows to the Colorado River. The water management strategies are intended to alleviate these projected water supply shortages (water needs). A table of the recommended water management strategies by WUG is contained in *Appendix 5B*. *Appendix 5D* contains the TWDB Costing Tool Cost Summary for each applicable strategy. In accordance with 31 TAC §357.34(e)(3)(A), regional and state water plans are not to include the cost of distribution of water within a water user group service area.

Regional water planning groups are required to take into account and report water loss estimates in the evaluation of water management strategies. A summary of municipal water loss for Region K is provided at the end of *Chapter 1*. It shows an average real loss of 14.1% for the region. Reported real losses for individual municipal WUG from the 2015 audit submitted to TWDB range from 0% to 61%. These real losses are embedded in the water use survey data that the TWDB uses to project municipal water demands and determine water needs in the regional water planning process. Certain conservation strategies recommended in the 2021 Region K Water Plan are intended to decrease the water loss for existing infrastructure, both for municipal and for irrigation water users. Drought management strategies recommended in this plan have no associated water losses. Strategies involving new or amended contracts or the purchase of water from a supplier are assumed to have no additional water losses with the use of existing infrastructure.

Recommended and alternative surface water strategies such as new reservoirs have water losses associated with evaporation that are included in the modeling analyses. Surface water strategies containing new infrastructure such as pump stations and transmission pipelines are assumed to have negligible water losses. Reuse projects are assumed to have negligible water losses as well.

Recommended and alternative groundwater strategies include aquifer storage and recovery (ASR), expanded local use of groundwater, and development of new groundwater supplies, including importation from outside of the region. ASR reduces the water losses associated with evaporation from a reservoir, but there can be water losses due to recovery efficiency from the aquifer. Migration rates vary depending on the aquifer used for storage, and impacts will depend on how long the stored water remains in the aquifer. Recovery efficiency will have some impacts on water volume but should have negligible impacts on the firm yield volumes. Groundwater expansion strategies that assume additional yield from existing infrastructure have no additional water losses associated with them. Groundwater expansion, development, and importation strategies that require new infrastructure are assumed to have negligible water losses. Desalination strategies in this plan have yields that are assumed to account for approximately 10 percent water loss, due to concentrate disposal.

Per House Bill 807 (HB 807), if a Regional Water Planning Area (RWPA) has significant identified water needs, the Regional Water Planning Group (RWPG) shall provide a specific assessment of the potential for ASR projects to meet those needs. At the October 9, 2019 meeting, the LCRWPG determined the threshold of significant water needs by evaluating existing needs in the LCRWPA. The LCRWPG did not believe ASR would be feasible cost-wise for the Irrigation WUGs in Colorado, Matagorda, and Wharton Counties, and therefore they removed Irrigation needs from consideration for this determination. Thus, significant identified water need was defined as a municipal WUG with a need of 10,000 ac-ft/yr or greater; this includes Austin, West Travis County PUA, and Aqua WSC.

- The needs in West Travis County PUA are met through conservation, drought management, and strategies requiring infrastructure. One such strategy, the Hays County Pipeline (*Section 5.2.4.3.1*), obtains its water from the Guadalupe-Blanco River Authority (GBRA) Mid-Basin (Phase 2) Project, which develops water from the Guadalupe River and an Aquifer Storage and Recovery (ASR) in the Carrizo-Wilcox in Gonzales County in Region L.
- The ASR evaluation for Austin may be found in *Section 5.2.3.2.3*.
- A full strategy evaluation of ASR was not conducted for Aqua WSC. In Aqua WSC, the current groundwater supply is limited, and utilization of surface water is required to meet needs in later decades. As such, the implementation of ASR is cost-prohibitive compared to the cost of surface water infrastructure.
- ASR was also evaluated and recommended for LCRA (*Section 5.2.3.1.12*) in the Carrizo-Wilcox Aquifer and smaller entities in Hays and Travis counties (*Section 5.2.4.4*).

5.2.1 Utilization of Return Flows

Approximately 60 percent of all municipal diversions by Austin and others are currently returned to the Colorado River as effluent discharges. Unless otherwise authorized by permit, once discharged to the river, this water is subject to diversion under existing water rights' permits. State law currently allows a water right holder to consumptively use all the water authorized by permit, unless discharge is required by permit. Direct reuse is one possible manner in which a water right holder may increase consumptive use of the water authorized for diversion and use under the water right. The Region K Cutoff WAM for the Colorado River that was used for determining water supply in this round of planning excludes all sources of return flows from the model. The inclusion of return flows in the model is proposed as a water management strategy for the benefit of water rights and environmental flows and indirect reuse by Austin in future regional water plans, consistent with a settlement agreement between Austin and the Lower Colorado River Authority.

The exclusion of all return flows in the determination of water supply leads to conservatively low estimates of available surface water supply for planning purposes. Water shortages for entities that currently use and rely upon the return flows may not be realistic as long as upstream return flow discharges continue into the future. For purposes of this plan, the water management strategies include use of projected state surface water that result from discharge of return flows by Austin and Pflugerville. Strategies related to Austin's reuse of treated effluent are described in *Section 5.2.3.2*. This plan assumed projected levels of effluent to be discharged by Pflugerville of 60 percent of the total projected demand after water savings for drought management, conservation, and reuse have been accounted for in each planning decade. Effluent not being directly reused by Austin as a strategy and these other projected levels of effluent were made available to help meet environmental flow needs of the river and Matagorda Bay and water rights, according to the prior appropriation doctrine. Therefore, return flow assumptions for purposes of developing LCRA's water management strategies incorporate and reflect Austin's proposed strategies of reuse of effluent to meet portions of municipal and manufacturing demand and Austin's steam-electric demand in Travis County, including use of reclaimed water at the Sand Hill Energy Center, and the return flow sharing strategy described in *Section 5.2.1.1*.

5.2.1.1 Austin Return Flows

In 2007, Austin and LCRA signed a settlement agreement that resolved several permitting disputes and outlined a proposed arrangement for shared rights to the beneficial use of return flows discharged by Austin. According to the settlement agreement, the two parties will seek regulatory approval to effectuate the strategy of joint return flow benefit. The settlement contemplates that the return flows will be managed between the two parties to first help satisfy environmental flow needs before Austin conducts indirect reuse. If Austin has an indirect reuse project in operation that is consistent with the terms and conditions of the Settlement Agreement, LCRA will not call on return flow passage for diversion under LCRA's water rights unless, first, environmental needs and, second, Austin's indirect reuse needs are met.

At this time, Austin has not developed plans for implementing an indirect reuse project under the Austin-LCRA Joint Application for Reuse pending at TCEQ, as outlined by Austin and LCRA 2007 Settlement Agreement. Future Region K plans are expected to include assumptions related to indirect reuse under this pending joint Austin-LCRA permit. Consistent with the 2007 settlement agreement language regarding the shared rights to the beneficial use of return flows and because Austin has not proposed a specific indirect reuse project under the pending joint Austin-LCRA permit, return flows were modeled for downstream water right availability only as an illustration of concept. First, return flows were allocated towards meeting environmental flow requirements (instream flow and bay and estuary freshwater inflow requirements) of LCRA's Water Management Plan, as contained in the Region K Cutoff model, as well as the Environmental Flow Standards for base flow at the Bastrop gage, as needed. Thereafter, the return flows were made available for use by downstream water rights according to the doctrine of prior appropriation.

In this plan, after meeting the environmental flow requirements, as needed, in the Region K Cutoff model, the projected remaining return flows were made available to meet all downstream demands, including municipal, irrigation, and industrial (including steam-electric) water needs, in accordance with the prior appropriation doctrine. The partitioning of Austin's municipal return flows between environmental flow requirements and water rights will be modeled by Austin and LCRA as part of the TCEQ permit review process. Environmental flow requirements will likely change in the future based on the latest scientific studies and actual water right utilization levels throughout the basin. The settlement agreement contemplates a framework for joint management between the two parties so that environmental flow requirements, as based on the best available science at the time, will be satisfied with Austin's return flows prior to beneficial use by either party's water rights.

Until Austin and LCRA have been granted regulatory approval for the strategy of joint return flow benefit and until Austin implements an indirect reuse project consistent with the terms and conditions of the Settlement Agreement, the beneficial use of these return flows as a water management strategy as indicated in *Table 5.2* helps meet the projected needs identified in *Chapter 4* which were the result of the conservative modeling assumptions used in *Chapter 3*.

The quantity of return flows is projected to remain somewhat consistent over the 50-year planning period. Even though water demands in in the Austin area are projected to increase the quantity of water reused during this period is projected to increase as well. However, beyond 2070 in the long-term, Austin projects that it will significantly increase its reuse of treated effluent to nearly 100 percent through direct and indirect reuse. As return flows discharged by Austin may diminish in the future due to enhanced reclamation of water, other sources may need to be dedicated or developed to meet needs that may currently be met by return flows discharged by Austin.

Table 5.2: Estimated Continued Benefits of Projected Austin Return Flows Strategy in the 2021 Region K Plan

Austin Return Flows	2020	2030	2040	2050	2060	2070
Projected Austin Effluent minus reuse	108,978	114,129	102,440	102,121	99,557	100,935
Estimated Benefits to Major Water Rights						
Highland Lakes	7,910	8,016	7,629	7,095	6,644	6,183
Austin	23,589	23,466	23,342	23,219	23,095	22,972
STP	2,396	2,349	2,303	2,257	2,210	2,164
Garwood [1]	2,000	2,000	2,000	2,000	2,000	2,000
Gulf Coast [1]	1,364	1,323	1,282	1,240	1,199	1,199
Lakeside [1]	6,876	6,701	6,525	6,349	6,174	6,174
Pierce Ranch [1]	1,594	1,509	1,424	1,339	1,254	1,254
Irrigation [2]	17,006	16,765	16,526	16,287	16,047	15,809
Estimated Benefit to Matagorda Bay	46,243	52,000	41,408	42,336	40,933	43,181

Note: Estimates derived using a version of the Region K Cutoff Model (Supply Version) with return flows included. The benefits for Garwood, Gulf Coast, Lakeside, Pierce Ranch, and Irrigation were post-processed based on percentages of each Water Right allocated for Irrigation and other uses.

[1] These values represent the gains due to return flows in the portions of the water rights used for non-irrigation purposes.
[2] This value represents the gains due to return flows in the portion of the Irrigation ROR water rights that are used for irrigation purposes.

Cost Implications of Proposed Strategy

There are no capital costs associated with the diversion of this water because the diversions are done under existing water rights permits with existing infrastructure. Energy costs have been calculated for diverting the return flows from the Colorado River using the TWDB Costing Tool. The annual energy costs are $1,217,000, with a unit cost of $11/ac-ft.

Environmental Considerations

Return flows provide a positive impact to the instream flows as they travel downstream to either reach the bay as freshwater inflows or be diverted by downstream water users.

Agricultural & Natural Resources Considerations

Return flows, when available for diversion by the downstream irrigators, provide a positive impact to agriculture. Benefits to irrigation are shown in *Table 5.2.*

Issues and Considerations

Issues related to ownership of treated wastewater effluent are discussed in *Chapter 8 (Section 8.1.8).*

5.2.1.2 Downstream Return Flows

In addition to Austin's return flows, return flows from Pflugerville are considered in the plan as a water management strategy. This strategy assumed a projected level of effluent to be discharged by Pflugerville of 60 percent of the total projected demand after water savings for drought management and conservation have been accounted for in each planning decade. Pflugerville currently has no plans for reuse, so it is assumed that all the effluent would be released for downstream use. It is also assumed that diversions available from the return flows will be reduced by 10 percent due to channel losses and evaporation, which have been incorporated into the yields. *Table 5.3* shows the estimated benefits of these return flows by planning decade. These downstream return flows are assigned as a benefit to LCRA.

Table 5.3: Downstream Return Flows Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
3,985	4,969	6,072	7,164	8,267	8,267

Cost Implications of Proposed Strategy

There are no capital costs associated with the diversion of this water because the diversions are done with existing infrastructure or proposed infrastructure with costs identified in other strategies. Energy costs have been calculated for diverting the return flows from the Colorado River using the TWDB Costing Tool. The annual energy costs are $89,000, with a unit cost of $11/ac-ft.

Environmental Considerations

Return flows provide a positive impact to the instream flows as they travel downstream to a diversion point. A potential diversion point for LCRA for these downstream return flows is the proposed Mid-Basin Reservoir project diversion point. Environmental impacts beyond the diversion point would be up to 8,267 ac-ft/yr of diverted flow.

Agricultural & Natural Resources Considerations

If the return flows are diverted for storage in the proposed Mid-Basin Reservoir by LCRA, negligible impacts to agricultural users are expected. There is a potential agricultural benefit from flows that are not stored and travel further downstream to be available for run-of-river irrigation diversions.

Issues and Considerations

Issues related to ownership of treated wastewater effluent are discussed in *Chapter 8* of the 2021 Region K Plan.

5.2.2 Conservation

The LCRWPG supports conservation as an important component of water planning. It is more effective and less costly to use less water than to develop new sources. Conservation can be implemented at the municipal, industrial, and agricultural levels.

All entities applying for a new water right or an amendment to an existing water right are required to prepare and implement a water conservation plan. The plan is to be submitted to TCEQ along with the application.

Additional entities that are required to prepare and submit conservation plans include municipal, industrial, and other non-agricultural water right holders of 1,000 ac-ft/yr or greater; and agricultural water right holders of 10,000 ac-ft/yr or greater.

Online model water conservation plans are available at the following link:

https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/conserve.html

5.2.2.1 LCRA Conservation

5.2.2.1.1. Enhanced Municipal and Industrial Conservation

LCRA recently completed its 2019 Water Conservation Plan that addresses water conservation practices for its firm water customers (municipal, industrial, power generation, and recreational). These efforts include five-year and 10-year water conservation goals for municipal (including firm irrigation/recreation customers), industrial, and agricultural use that will promote effective water conservation throughout communities in LCRA’s rapidly growing service area. More details on the 2019 Water Conservation Plan can be found online at:

https://www.lcra.org/water/watersmart/Documents/LCRA-WCP-May2019.pdf.

Conservation measures include regulations, financial incentives, and education for water efficiency. All customers with new or renewing contracts must develop and implement water conservation plans. Along with the basic requirements, LCRA actively encourages customers to adopt additional measures such as a permanent watering schedule limiting use to twice per week and irrigation standards for new development. Financial incentives include providing cost-share grants to firm water customers and offering financial incentives for landscape irrigation technologies. Education efforts include providing irrigation evaluation training and assistance for wholesale customers' staff, community outreach presentations and participating in the coordination of the Central Texas Water Efficiency Network annual water conservation symposium.

Table 5.4 below shows the expected water savings from the enhanced municipal and industrial conservation strategy. It should be noted that the municipal water savings are from LCRA customers, most of which are also Water User Groups in the Region K planning process and are likely already included in the Municipal Conservation strategy in *Section 5.2.2.3*. The savings for the municipal strategies will be achieved through LCRA customer WUGs and are not above and beyond the conservation strategy savings associated with those individual WUGs. We want to acknowledge the impact that LCRA has by providing education and funding to its customers for implementation of conservation measures, but these savings are not counted in addition to the savings documented in *Table 5.8* in the Municipal Conservation section. The municipal water savings portion in *Table 5.4* below is approximately 4,500 ac-ft/yr in 2020 and 9,000 ac-ft/yr in 2030 and increases proportionally in later decades, leaving 600 ac-ft/yr of water savings for industrial purposes in 2020, 700 ac-ft/yr in 2030, and increasing proportionally in later decades.

Table 5.4: Water Savings from LCRA Enhanced Municipal and Industrial Conservation (ac-ft/yr)

Decade	Water Savings (ac-ft/yr)
2020	5,100
2030	9,700
2040	15,000
2050	20,000
2060	20,000
2070	20,000

Cost Implications of Proposed Strategy

The cost for this strategy was developed as part of the 2010 *Water Supply Resource Plan: Water Supply Option Analysis (Strategy II)* for LCRA. For the 2021 Region K Plan, capital costs were updated to $53,647,000 (September 2018 dollars). The TWDB Cost Estimating Tool was used to calculate total project costs at $74,415,000. The total annual cost is $5,236,000, generating a unit cost of $262/ac-ft of water saved. The cost per volume of water is expected to vary over implementation, and LCRA anticipates a range between $300 and $400/ac-ft, allowing that some of the costs associated with the conservation measures would not be capital. The most cost-effective conservation measures would be expected to be implemented first, and thus the cost per volume saved would expect to increase over time. For municipal WUGs discussed in Section 5.2.2.3, this cost is already incorporated into the WUG cost. LCRA would be off-setting a portion of their costs.

Environmental Impact

Conservation program does not require additional infrastructure which has the potential to require environmental mitigation or other measures to address impacts.

The impacts of this strategy should be considered negligible, as the impacts are already accounted for in the individual conservation strategies identified in *Sections 5.2.2.3*.

Agricultural & Natural Resources Considerations

Impacts to agriculture are anticipated to be negligible, as enhanced municipal and industrial conservation will reduce a small portion of the expected increases to firm demands over time.

5.2.2.1.2. Agricultural Conservation

Irrigators in Colorado, Wharton, and Matagorda Counties have the largest irrigation needs in Region K. LCRA's strategies to be implemented as part of its sale of water to Williamson County under HB 1437 and those under its Agricultural Water Supply Resource Plan (WSRP) are designed to extend the availability of interruptible water supply to meet irrigation demands beyond that which would be expected without those improvements. LCRA actively pursues state and federal grants to supplement HB 1437 and other funds to implement irrigation operation conveyance improvements. Many strategies, which are outlined in detail under Irrigation Conservation in *Section 5.2.2.5* rely are based on the various strategies outlined in the Agricultural WSRP. Costs and savings for some of these strategies, such as automating the operation of major check structures and creating a centralized SCADA control system, have been updated based on projects that are already underway.

5.2.2.2 Austin Conservation

Austin began an aggressive water conservation program in the mid-1980s in response to rapid growth and a series of particularly dry years. Austin has achieved significant reductions in both per capita consumption and peak day to average day demand ratio. For the per capita use calculations, Austin used a modified GPCD from year 2011 approved by the LCRWPG and TWDB as their base year since Austin had mandatory water conservation measures in place from September through December that year.

In 1990, Austin's conservation program evolved from primarily reacting to high summertime demands to a comprehensive program with the goals of reducing both per capita consumption and peak day demand. To achieve these broader goals, Austin has implemented and anticipates continuing water conservation efforts and programs in a number of areas including:

- Leak reduction, leak response, and water loss reduction
- Water main replacement program
- Drought tolerant WaterWise landscaping
- Irrigation system audits and efficiency programs
- Water use efficiency programs including irrigation system and vehicle wash facility assessments
- Public education and outreach including school programs
- Rebate and incentive programs
- Local ordinances that increase water efficiency by customers (e.g., water use benchmarking, landscape transformation)
- Support of legislation that increases water efficiency in plumbing products and appliances at both the State and Federal level
- Increased water efficiency in utility operations
- Conservation-oriented tiered rate structures
- A/C Condensate recovery and cooling tower rebates
- Meter and water use efficiency programs

Through its various water conservation programs, Austin has made significant advances in reducing per capita water use in its service area. Austin is committed to continuing to seek ways to reduce its per capita demands as a best management practice for its utility. In 2009, the Austin City Council charged the Citizens Water Conservation Implementation Task Force (CWCITF) with producing a list of possible conservation measures to reduce water use in Austin beyond the savings that were expected from recommendations from a previous City Council created water conservation task force, the 2007 Water Conservation Task Force. As directed by Council resolution in May 2010, Austin Water evaluated the savings potential of the CWCITF strategies along with the savings expected from ongoing and planned efforts and developed an action plan to reduce water use in Austin to 140 gallons per capita, per day or lower by 2020. In harmony with this goal, efforts are made to increase Austin's customers' understanding of their water use and to educate them on ways to use water more efficiently. The following strategies were identified by Austin Water 140 GPCD Conservation Plan (140 Plan) to meet the following program goals:

- Reach 140 GPCD by 2020
- Reduce peak demand
- Pursue cost effective strategies
- Ensure conservation reaches all customer sectors
- Ensure consumer awareness of conservation
- Promote innovation in water conservation

Over the past ten years, Austin Water's conservation measures and programs have achieved or exceeded the following goals:

- Reducing peak daily demand by one percent per year over a ten-year period or by 25 million gallons per day (MGD) by 2017; and
- Reducing average per capita water use on a rolling 5-year basis to no more than 140 gallons per capita per day (GPCD) by 2020.

The utility achieved its ten-year peak day reduction goal within three years, or in 2010, and achieved its ten-year goal of a rolling 5-year total average per capita water use of 140 GPCD within five years, or in 2015. The utility further decreased its total average per capita consumption to 120 GPCD in 2019.

In the 2019 update to its Water Conservation Plan, Austin set new five and ten-year total average per capita consumption goals of 119 GPCD by 2024 and 106 GPCD by 2029, to be achieved primarily through the implementation of new demand management strategies identified in the November 2018 *Water Forward Plan*. Implementation and additional savings from many of these new programs are expected to begin over the next five years.

A system water loss reduction goal under the *Water Forward Plan* includes maintaining an Infrastructure Leak Index (ILI) at or below 2.7 by 2020 and further reducing and maintaining ILI to 2.0 or below by 2040. Austin Water reported a preliminary ILI of 3.84 in 2018. ILI is an indication of the level of leakage in a water system, with lower ILIs representing lower-water-loss-systems.

Projected savings from municipal and manufacturing conservation are shown in the following table. Note that these projected savings from conservation represent estimated savings from implementing Austin's Water Forward Plan strategies. These strategies include implementation of water loss reduction efforts, water main and service line replacements, advanced metering infrastructure, landscape transformation, and AC condensate reuse. These savings do not include additional potential savings from water conservation and demand reduction measures such as graywater use, rainwater harvesting, stormwater harvesting, and water reuse. Additional conservation savings from these other demand reduction strategies are discussed in upcoming sections.

Table 5.5: Austin Conservation Strategy Yield (ac-ft/yr)

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
4,910	14,890	24,870	30,120	35,370	40,620

Costs Implications of Proposed Strategy

Capital and O&M costs were provided by the Austin Water Forward Plan, dated 2018. In order to provide a comparable cost consistent with other strategies in this report, annual costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars. Costs were calculated to include a variety of conservation measures. The unit cost is presented as an average, with some conservation measures being more expensive and some being less. Capital costing efforts focused on advanced metering infrastructure (smart meters), water main and service line replacements, and leak detection and repair, but were meant to encompass other types of capital-cost associated conservation measures as well, including continued implementation of the conservation strategies included in the bulleted list above. The unit cost for this strategy has increased significantly since the last planning cycle; this is largely due to an increased scope of utility-side water loss control efforts.

Many of the non-capital cost measures are mentioned above, but it is not an exclusive list, and Region K encourages the TWDB to provide funding for all types of conservation measures for WUGs and wholesale water providers within Region K and around the state.

Table 5.6: Austin Conservation Strategy Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$514,560,000	$719,616,000	$54,569,000	$1,343

Environmental Considerations

Water conservation is a beneficial strategy. For example, water conservation strategies generally do not require the movement of water between locations. In addition, water conservation generally does not result in adverse impacts to environmental flows or other environmental considerations. The conservation strategies by Austin are estimated to reduce demand by an additional 40,620 ac-ft/yr by 2070. Note that water conservation can cause changes to wastewater concentrations over time, in which case treatment processes may need to be adjusted to maintain permitted discharge parameters.

Agricultural & Natural Resources Considerations

Negligible direct impacts to agriculture are anticipated as a result of this strategy. Negligible direct impacts to other water resources are expected as a result of implementing this strategy.

5.2.2.3 Municipal Conservation

Reduction of municipal water demand through conservation has been a primary focal point for Regional Water Planning in Texas since the 2011 planning cycle. The water demands approved by TWDB and the individual Regional Water Planning Groups (RWPGs) have already been adjusted to incorporate the effects of the 1991 State Water Saving Performance Standards for Plumbing Fixtures Act. In addition, RWPGs are required to consider further water conservation measures in their plan or explain reasons for not recommending conservation for Water User Groups (WUGs) with water needs.

The Lower Colorado Regional Planning Area (LCRWPA) currently anticipates 58 municipal WUGs with shortages in the year 2070. Thirty-eight (38) of these WUGs have per capita water demands in excess of the 140 gallons per capita per day (GPCD) goal proposed by the Water Conservation Implementation Task Force (WCITF) and may be able to reduce their shortages through conservation practices.

A methodology was developed to determine the anticipated municipal water conservation savings for the WUGs within the LCRWPA. First, WUGs were required to meet the following criteria to be chosen for conservation measures:

- Be a municipal WUG. Conservation was considered, regardless of whether a municipality had a water need.
- Have a year 2020 per capita water usage of greater than 140 GPCD, indicating a potential for savings through conservation.

Per capita water demands were determined from the measured or projected population and water demands for each WUG during each decade. The following methodology was used in calculating water demand reductions:

- If the 2020 GPCD is greater than 140, 10% GPCD reduction per decade until 140 GPCD is reached.
- If the 2020 GPCD is less than 140, no conservation is considered.
- Defer to Water Conservation goals, if applicable.

This method is slightly more conservative than the WCITF recommendation of a 1 percent per year reduction in per capita water demand in order to reach the target demand of 140 GPCD. Conservation was applied immediately in 2020 regardless of the beginning year of a WUG shortage so that conservation could be implemented early enough to have significant effects on demand by the time the shortage was realized.

A lower limit of 140 GPCD was set unless a WUG specified in their Water Conservation Plan their intent to reduce further. This was done so that conservation was only recommended to reach reasonable levels. For WUGs that were anticipated to reach a per capita usage below 140 GPCD without conservation in later decades, the lower demands approved by the Regional Planning Group and TWDB were carried forward.

The new per capita usage for each decade was then used along with the projected WUG population to determine the new projected water demands for each decade. These values were subtracted from the original water demands to determine the amount of water conserved in each decade. Per House Bill (HB) 807 of the 86th Texas Legislature, the new per capita daily usage is included in *Appendix 5C.*

Burnet County-Other did not fall under the above criteria but is recommended to receive water from the Buena Vista Regional Project *(Section 5.2.4.5.1*) through an interbasin transfer, requiring that the highest practicable level of achievable water conservation be considered. Therefore, municipal conservation is recommended for Burnet County-Other, Brazos Basin, based on the achievement of 130 GPCD by 2020 and 125 GPCD by 2030.

This strategy is recommended using the criteria above, as and is shown in

The Austin WUG is not included in this strategy because Austin Water Conservation is a separate strategy and is discussed in *Section 5.2.3.2.1*.

Examples of measures that can be implemented to meet municipal conservation include, but are not limited to, the following:

Utility water loss audits and repair. System water audits are required every five years for all retail utilities and every year for utilities over 3,300 connections. To maximize the benefits of this measure, a utility would use the information from the water audit to revise meter testing and repair practices, reduce unauthorized water use, improve accounting for unbilled water, and implement effective water loss management strategies. Water loss strategies for new development, to minimize the need for line flushing, can include the addition of extra meters along various line routes to collect more accurate data on water flowing through those routes, creating loops in the water distribution lines, and placing chlorine injection stations strategically throughout the development to avoid the need for excessive flushing to keep chlorine residuals in compliance.

"Smart" meters and automatic meter infrastructure (AMI). A "smart" water meter is a measuring device that has the ability to store and transmit consumption data frequently. Sometimes "smart" meters are referred to as "time-of-use" meters because in addition to measuring the volume consumed, they also record the date and time the consumption occurs. "Smart" meters can be read remotely and more frequently, providing instant access to water consumption information for both customers and water utilities. "Smart" water meters are one component of an automated meter infrastructure (AMI) system that water utilities may choose to deploy. AMI systems using "smart" water meters are capable of measuring, collecting, and analyzing water use information and then communicating this information back to the customer via the internet either on request or on a fixed schedule. AMI systems can include hardware, software, communications, consumer water use portals and controllers, and other related systems. AMI differs from automatic meter reading (AMR) in that it enables two-way communications with the meter and the water utility. AMI extends current advanced meter reading (AMR) technology by providing two-way meter communications for purposes such as real-time usage and pricing information, leak and abnormal usage detection, and targeted water efficiency messaging.

Customer behavioral engagement software. Software programs are now available that utilize customer water use data to develop individual water use reports for customers. This software works best when a utility has AMI but can also be used without AMI. The objectives of this measure are to assist customers with their personal water management, identify potential water savings, achieve water and cost savings, and increase customer participation in the utility's incentive programs. These software programs can provide information in a variety of ways and have the ability to run on multiple platforms, including computers, tablets and mobile phone devices. One utility utilizing this type of program identified a 3-5% savings in total water use of customers utilizing this information compared to a control group.

A permanent landscape watering schedule limiting spray irrigation of ornamental landscape to no more than twice per week. Several communities in Region K have already adopted a permanent watering schedule for the hot periods of the year, typical from May 1 to September 30 each year. Austin has adopted a year-round similar schedule on a year-round basis. This measure, if enforced, saves a substantial amount of water and also lowers peak use during the summer, reducing pressure on water treatment plants and extending the period of time before a new plant is needed.

In the March 2018 report *Water Conservation by the Yard: A Statewide Analysis of Outdoor Water Savings Potential*, the Sierra Club, National Wildlife Federation, and Texas Living Waters Project provided a regional and statewide perspective of outdoor water use and the potential savings from year-round no more than twice per week watering restrictions. WUGs with conservation as a recommended strategy can reference *Table 5.7* for informational purposes showing the impact of the potential water savings. Should a WUG make low efforts of implementation, an estimated 3.5% of the GPCD can be reduced. High efforts of implementation, including education and enforcement, can result in a reduction of 8.5%.

Table 5.7: Reference Information on Potential Savings from Outdoor Watering Restriction to No More than Twice Per Week

WUG	Municipal Demand (ac-ft/yr)		Low Effort Water Savings (3.5%) (ac-ft/yr)		High Effort Water Savings (8.5%) (ac-ft/yr)	
	2020	2070	2020	2070	2020	2070
Aqua WSC (p)	10,318	37,239	361	1,303	877	3,165
Barton Creek West WSC	436	427	15	15	37	36
Barton Creek WSC	524	893	18	31	45	76
Bastrop	2,046	8,660	72	303	174	736
Bertram	430	764	15	27	37	65
Blanco	316	425	11	15	27	36
Buda (p)	1,768	7,338	62	257	150	624
Burnet	1,661	2,949	58	103	141	251
Cedar Park (p)	2,251	2,546	79	89	191	216
Columbus	1,134	1,313	40	46	96	112
Cottonwood Shores	245	433	9	15	21	37
County-Other, Bastrop	1,418	3,437	50	120	121	292
County-Other, Burnet	3,414	4,838	119	169	290	411
County-Other, Travis (Aqua Texas - Rivercrest)	317	312	11	11	27	27
Creedmoor-Maha WSC	643	1,008	23	35	55	86
Cypress Ranch WCID 1	121	163	4	6	10	14
Dripping Springs WSC	1,930	7,476	68	262	164	635
Elgin	1,572	5,704	55	200	134	485

WUG	Municipal Demand (ac-ft/yr)		Low Effort Water Savings (3.5%) (ac-ft/yr)		High Effort Water Savings (8.5%) (ac-ft/yr)	
	2020	2070	2020	2070	2020	2070
Fayette County WCID Monument Hill	184	235	6	8	16	20
Flatonia	346	470	12	16	29	40
Fredericksburg	3,351	4,322	117	151	285	367
Georgetown (p)	84	150	3	5	7	13
Goldthwaite	400	451	14	16	34	38
Hays County WCID 1	821	797	29	28	70	68
Hays County WCID 2	285	844	10	30	24	72
Horseshoe Bay	2,816	3,624	99	127	239	308
Hurst Creek MUD	1,718	1,699	60	59	146	144
Johnson City	353	480	12	17	30	41
Jonestown WSC	675	866	24	30	57	74
Kelly Lane WCID 1	322	311	11	11	27	26
Kempner WSC (p)	132	196	5	7	11	17
La Grange	957	1,292	33	45	81	110
Lago Vista	1,868	3,428	65	120	159	291
Llano	862	913	30	32	73	78
Loop 360 WSC	1,225	1,486	43	52	104	126
Marble Falls	2,354	6,446	82	226	200	548
Matagorda Waste Disposal & WSC	127	137	4	5	11	12
Meadowlakes	852	835	30	29	72	71
North San Saba WSC	185	195	6	7	16	17
Oak Shores Water System	150	169	5	6	13	14
Pflugerville (p)	10,403	21,156	364	740	884	1,798
Richland SUD (p)	224	235	8	8	19	20
Rollingwood	383	377	13	13	33	32
Rough Hollow in Travis County	589	1,213	21	42	50	103
Round Rock (p)	278	470	10	16	24	40
San Saba	1,175	1,241	41	43	100	105
Schulenburg	701	958	25	34	60	81
Senna Hills MUD	420	708	15	25	36	60

WUG	Municipal Demand (ac-ft/yr)		Low Effort Water Savings (3.5%) (ac-ft/yr)		High Effort Water Savings (8.5%) (ac-ft/yr)	
	2020	2070	2020	2070	2020	2070
Shady Hollow MUD	793	749	28	26	67	64
Smithville	821	3,125	29	109	70	266
Sunset Valley	368	753	13	26	31	64
Travis County MUD 10	74	124	3	4	6	11
Travis County MUD 4	1,500	2,603	53	91	128	221
Travis County WCID 10	3,499	5,026	122	176	297	427
Travis County WCID 17	9,370	11,841	328	414	796	1,006
Travis County WCID 18	1,070	1,779	37	62	91	151
Travis County WCID 19	449	444	16	16	38	38
Travis County WCID 20	584	577	20	20	50	49
Travis County WCID Point Venture	255	624	9	22	22	53
Weimar	496	569	17	20	42	48
West Travis County Public Utility Agency	11,197	20,507	392	718	952	1,743
Wharton	1,680	1,955	59	68	143	166
Wharton County WCID 2	456	535	16	19	39	45
Windermere Utility	2,920	2,809	102	98	248	239
Total Potential Savings from Outdoor Watering Restrictions			**3,395**	**6,535**	**8,246**	**15,872**

(p) - demands and potential savings shown are only for the portion of the WUG that lies within the Region K boundaries
Note: Lakeway MUD requested not to be included in this table as they have already implemented year-round twice per week watering restrictions.

<u>TCEQ 344 landscape irrigation standards for all new development.</u> House Bill 1656, passed in 2007, requires all municipalities with a population of more than 20,000 to adopt these standards. Municipal utility districts and water control improvement districts were also allowed to adopt the standards. Some of the requirements include requiring licensed irrigators to properly design and install the irrigation including proper pressure and zoning for plan requirements, installing a rain sensor, no spray on narrow strips of landscape and other design standards. The licensed irrigator is also required to leave a water schedule and design plan with the customer.

<u>Landscape standards for new development.</u> Several Region K WUGs have adopted a variety of landscape standards, including requiring the use of native and adapted plants and drought tolerant turf, limits on irrigated landscape or turf area and a minimum of six inches of adequate soil. The Capital Area Homebuilder's Association adopted recommended standards for new development that have many of these same requirements.

<u>Landscape irrigation evaluations.</u> WUGs can provide or hire a service to provide this service if a majority of customers in the utility service area utilize automatic in-ground irrigation systems. These evaluations

can identify irrigation system issues such as leaks, as well as provide the customer with an efficient, appropriate watering schedule. This service also provides a positive customer service image for the utility and can affect positive behavior change through face to face site visits with individual customers.

Public outreach and education programs. To be effective, water conservation education and outreach should be planned and implemented in a consistent and continual manner. Traditional methods such as print and electronic media activities and staffing of community events can be combined effectively with social media applications to relay messaging quickly and frequently to a wide audience with little cost. For smaller utilities, there are many low-cost or free resources available that can be utilized to implement effective public outreach and education programs.

Region K encourages the TWDB to provide funding for all types of conservation measures for WUGs and wholesale water providers within Region K and around the state. The Texas Water Conservation Advisory Council provides ongoing development and updates of many conservation measures – or best management practices (BMPs) – that can meet a WUG's water conservation strategy. More information can be found at the Council's website www.savetexaswater.org.

Table 5.8 shows conservation water savings based on the methodology above. Target GPCD goals, as required for inclusion in the plan by HB807 and based on the methodology above, are included in *Appendix 5C*.

Table 5.8: Municipal Conservation Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Aqua WSC	Bastrop	Brazos	4	2	1	0	0	0
Aqua WSC	Bastrop	Colorado	408	244	116	33	0	0
Aqua WSC	Bastrop	Guadalupe	3	2	1	0	0	0
Bastrop	Bastrop	Colorado	184	355	433	558	744	992
County-Other, Bastrop	Bastrop	Brazos	1	1	1	2	2	2
County-Other, Bastrop	Bastrop	Colorado	124	198	219	255	307	381
County-Other, Bastrop	Bastrop	Guadalupe	3	5	5	6	8	9
Elgin	Bastrop	Colorado	66	119	224	405	531	700
Smithville	Bastrop	Colorado	69	59	54	59	75	97
Blanco	Blanco	Guadalupe	0	27	23	21	21	21
Johnson City	Blanco	Colorado	31	28	25	23	23	23
Bertram	Burnet	Brazos	39	85	142	205	238	257
Burnet	Burnet	Brazos	1	1	2	3	3	3
Burnet	Burnet	Colorado	149	329	543	691	754	810
Cottonwood Shores	Burnet	Colorado	22	26	27	28	29	32

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other, Burnet	Burnet	Brazos	63	91	71	68	70	74
County-Other, Burnet	Burnet	Colorado	112	162	127	122	125	131
Georgetown	Burnet	Brazos	8	17	28	35	39	41
Horseshoe Bay	Burnet	Colorado	49	134	241	368	505	645
Kempner WSC	Burnet	Brazos	12	12	11	11	12	12
Marble Falls	Burnet	Colorado	212	567	1,193	1,801	2,387	2,566
Meadowlakes	Burnet	Colorado	77	145	210	271	326	377
Columbus	Colorado	Colorado	102	195	286	384	484	581
Weimar	Colorado	Colorado	15	27	40	50	51	53
Weimar	Colorado	Lavaca	30	56	82	102	105	108
Fayette County WCID Monument Hill	Fayette	Colorado	17	33	50	68	75	78
Flatonia	Fayette	Guadalupe	6	12	17	17	18	19
Flatonia	Fayette	Lavaca	25	51	73	75	78	80
La Grange	Fayette	Colorado	86	82	69	63	64	66
Schulenburg	Fayette	Lavaca	63	128	199	235	246	254
Fredericksburg	Gillespie	Colorado	302	598	903	1,234	1,578	1,802
Buda	Hays	Colorado	159	292	382	499	636	793
Dripping Springs WSC	Hays	Colorado	174	289	339	417	522	576
Hays County WCID 1	Hays	Colorado	74	136	196	226	225	225
Hays County WCID 2	Hays	Colorado	26	62	114	169	211	259
West Travis County Public Utility Agency	Hays	Colorado	405	984	1,610	2,546	3,631	4,840
Horseshoe Bay	Llano	Colorado	204	406	574	746	887	1,000
Llano	Llano	Colorado	78	147	208	263	285	295
Matagorda Waste Disposal & WSC	Matagorda	Brazos-Colorado	5	6	5	5	5	5
Matagorda Waste Disposal & WSC	Matagorda	Colorado	7	10	8	7	8	8
Goldthwaite	Mills	Brazos	1	2	2	2	2	2

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Goldthwaite	Mills	Colorado	35	63	59	57	59	61
North San Saba WSC	San Saba	Colorado	17	32	46	60	74	85
Richland SUD	San Saba	Colorado	20	39	55	69	70	72
San Saba	San Saba	Colorado	106	208	300	378	469	556
Aqua WSC	Travis	Colorado	49	26	10	3	0	0
Barton Creek West WSC	Travis	Colorado	39	76	109	139	167	193
Barton Creek WSC	Travis	Colorado	47	110	183	258	330	409
Cedar Park	Travis	Colorado	203	420	590	586	583	582
County-Other, Travis (Aqua Texas - Rivercrest)	Travis	Colorado	29	55	79	102	123	142
Creedmoor-Maha WSC	Travis	Colorado	30	37	55	86	93	100
Creedmoor-Maha WSC	Travis	Guadalupe	2	2	4	6	6	6
Cypress Ranch WCID 1	Travis	Colorado	6	9	14	20	21	20
Elgin	Travis	Colorado	13	25	47	81	94	107
Hurst Creek MUD	Travis	Colorado	155	302	437	560	673	776
Jonestown WSC	Travis	Colorado	56	47	41	39	40	41
Kelly Lane WCID 1	Travis	Colorado	29	52	48	47	46	46
Lago Vista	Travis	Colorado	168	375	622	914	1,098	1,198
Lakeway MUD	Travis	Colorado	248	492	748	1,015	1,169	1,168
Loop 360 WSC	Travis	Colorado	110	225	339	450	559	679
Oak Shores Water System	Travis	Colorado	14	29	42	54	65	70
Pflugerville	Travis	Colorado	563	549	606	674	754	743
Rollingwood	Travis	Colorado	34	64	90	116	142	148
Rough Hollow in Travis County	Travis	Colorado	53	220	319	319	319	319
Round Rock	Travis	Colorado	6	1	0	0	0	0
Senna Hills MUD	Travis	Colorado	38	85	142	200	258	321

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Shady Hollow MUD	Travis	Colorado	71	90	74	65	64	64
Sunset Valley	Travis	Colorado	33	73	123	183	256	343
Travis County MUD 10	Travis	Colorado	7	15	25	27	28	30
Travis County MUD 4	Travis	Colorado	135	309	507	731	962	1,198
Travis County WCID 10	Travis	Colorado	315	660	1,031	1,440	1,858	2,275
Travis County WCID 17	Travis	Colorado	843	1,748	2,794	3,658	4,317	4,451
Travis County WCID 18	Travis	Colorado	75	58	47	43	43	46
Travis County WCID 19	Travis	Colorado	40	79	114	146	176	203
Travis County WCID 20	Travis	Colorado	53	103	149	190	228	263
Travis County WCID Point Venture	Travis	Colorado	23	55	94	146	189	216
West Travis County Public Utility Agency	Travis	Colorado	603	1,295	2,034	2,914	3,729	4,530
Windermere Utility	Travis	Colorado	118	62	29	13	8	7
Wharton	Wharton	Brazos-Colorado	83	91	73	67	68	69
Wharton	Wharton	Colorado	68	74	60	55	55	57
Wharton County WCID 2	Wharton	Brazos-Colorado	41	76	97	96	99	101
Total			**7,994**	**14,456**	**21,090**	**28,080**	**34,602**	**39,912**

Cost Implications of Proposed Strategy

Facility costing efforts focused on smart meters and leak detection and repair but were meant to encompass other types of capital-cost associated conservation measures as well. Costs for leak detection and repair were estimated assuming 10% of the WUG's pipeline is replaced in a 50-year timespan. Implementing this conservation strategy would reduce approximately 3% of the demand. Smart meters were assumed a cost of $270 per home, with the assumption that 100 percent of homes would implement this strategy over the planning horizon. Implementing this conservation strategy would reduce approximately 5% of the demand. If overall calculated water savings were less than facility implementation, assumptions were modified to more accurately reflect calculated savings. *Table 5.9* and *Table 5.10* show a breakdown of costs associated with leak detection and repair and advanced metering infrastructure, respectively.

Table 5.9: Municipal Conservation – Leak Detection and Repair Costs

WUG	Pipe Length* (Miles)	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC (p)	28.9	174	$8,766,000	$11,710,000	$824,000	$4,733
Barton Creek West WSC	0.7	13	$212,000	$284,000	$20,000	$1,561
Barton Creek WSC	2	27	$606,000	$810,000	$57,000	$2,128
Bastrop	6	260	$1,818,000	$2,428,000	$171,000	$658
Bertram	2	23	$359,000	$480,000	$34,000	$1,483
Blanco	3.5	10	$1,055,000	$1,409,000	$99,000	$9,814
Buda (p)	4.6	220	$1,388,000	$1,854,000	$130,000	$591
Burnet	6.1	88	$1,848,000	$2,469,000	$174,000	$1,967
Cedar Park (p)	6	76	$1,817,000	$2,427,000	$171,000	$2,239
Columbus	4	39	$1,203,000	$1,607,000	$113,000	$2,869
Cottonwood Shores	2.3	12	$411,000	$549,000	$38,000	$3,197
County-Other, Bastrop	4.5	103	$1,360,000	$1,817,000	$128,000	$1,241
County-Other, Burnet	5.3	95	$1,607,000	$2,146,000	$151,000	$1,591
County-Other, Travis (Aqua Texas - Rivercrest)	2.5	9	$754,000	$1,007,000	$71,000	$7,585
Creedmoor-Maha WSC	3.1	30	$933,000	$1,246,000	$88,000	$2,910
Cypress Ranch WCID 1	0.7	5	$209,000	$279,000	$20,000	$4,090
Dripping Springs WSC	6.3	216	$1,897,000	$2,533,000	$178,000	$824
Elgin	4.9	171	$1,485,000	$1,983,000	$140,000	$818
Fayette County WCID Monument Hill	0.7	7	$126,000	$168,000	$12,000	$1,702
Flatonia	3.4	14	$615,000	$821,000	$58,000	$4,113
Fredericksburg	13.7	130	$4,151,000	$5,544,000	$390,000	$3,008
Georgetown (p)	2.1	5	$371,000	$495,000	$35,000	$7,778
Goldthwaite	2.3	14	$697,000	$931,000	$66,000	$4,878
Hays County WCID 1	3.4	24	$1,031,000	$1,377,000	$97,000	$4,057
Hays County WCID 2	2.4	25	$436,000	$583,000	$41,000	$1,619
Horseshoe Bay	14.5	109	$4,394,000	$5,869,000	$413,000	$3,799
Hurst Creek MUD	1.7	51	$500,000	$668,000	$47,000	$922
Johnson City	2.1	12	$636,000	$849,000	$60,000	$5,161
Jonestown WSC	4.9	21	$1,491,000	$1,992,000	$140,000	$6,679

WUG	Pipe Length* (Miles)	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Kelly Lane WCID 1	1.2	9	$358,000	$478,000	$34,000	$3,644
Kempner WSC (p)	1.7	5	$305,000	$408,000	$28,000	$6,022
La Grange	4.6	32	$1,389,000	$1,855,000	$131,000	$4,057
Lago Vista	12.5	103	$3,788,000	$5,059,000	$356,000	$3,462
Lakeway MUD	6.8	96	$2,061,000	$2,753,000	$194,000	$2,014
Llano	5.3	27	$1,606,000	$2,145,000	$151,000	$5,513
Loop 360 WSC	1.2	45	$370,000	$494,000	$35,000	$785
Marble Falls	9.4	193	$2,848,000	$3,805,000	$268,000	$1,386
Matagorda Waste Disposal & WSC	3.9	4	$700,000	$935,000	$66,000	$16,058
Meadowlakes	3.5	25	$1,048,000	$1,400,000	$98,000	$3,912
North San Saba WSC	8.5	6	$1,525,000	$2,038,000	$143,000	$24,444
Oak Shores Water System	0.4	5	$121,000	$161,000	$11,000	$2,170
Pflugerville (p)	7	283	$2,120,000	$2,831,000	$199,000	$704
Richland SUD (p)	2.3	7	$416,000	$556,000	$39,000	$5,532
Rollingwood	1.6	11	$485,000	$647,000	$46,000	$4,067
Rough Hollow in Travis County	3	36	$904,000	$1,207,000	$85,000	$2,336
Round Rock (p)	0	2	$6,000	$8,000	$1,000	$417
San Saba	5.9	37	$1,788,000	$2,388,000	$168,000	$4,512
Schulenburg	3.1	29	$939,000	$1,255,000	$88,000	$3,062
Senna Hills MUD	0.5	21	$152,000	$202,000	$14,000	$659
Shady Hollow MUD	1.5	22	$455,000	$607,000	$43,000	$1,914
Smithville	1.3	37	$402,000	$536,000	$38,000	$1,040
Sunset Valley	0.8	23	$242,000	$324,000	$23,000	$1,018
Travis County MUD 10	0.5	4	$142,000	$189,000	$13,000	$3,495
Travis County MUD 4	5.5	78	$1,667,000	$2,227,000	$157,000	$2,011
Travis County WCID 10	7.8	151	$2,364,000	$3,157,000	$222,000	$1,472
Travis County WCID 17	26.2	355	$7,939,000	$10,605,000	$746,000	$2,100
Travis County WCID 18	2	28	$616,000	$823,000	$58,000	$2,059
Travis County WCID 19	0.3	13	$79,000	$106,000	$7,000	$526
Travis County WCID 20	1.1	17	$333,000	$445,000	$31,000	$1,791

WUG	Pipe Length* (Miles)	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Travis County WCID Point Venture	1.1	19	$333,000	$445,000	$31,000	$1,656
Weimar	2.2	17	$667,000	$891,000	$63,000	$3,691
West Travis County Public Utility Agency	28	615	$8,485,000	$11,333,000	$797,000	$1,295
Wharton	8.1	59	$2,454,000	$3,278,000	$231,000	$3,939
Wharton County WCID 2	2.5	16	$758,000	$1,012,000	$71,000	$4,424
Windermere Utility	2.8	44	$845,000	$1,129,000	$79,000	$1,781

(p) - demands and potential savings shown are only for the portion of the WUG that lies within the Region K boundaries
* 10% of total pipeline length for utility assumed for replacement.

Table 5.10: Municipal Conservation – Advanced Metering Infrastructure Costs

WUG	Smart Meters Installed by 2070	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC (p)	12,347	290	$3,334,000	$4,453,000	$647,000	$2,230
Barton Creek West WSC	446	21	$120,000	$160,000	$23,000	$1,077
Barton Creek WSC	402	45	$109,000	$146,000	$21,000	$470
Bastrop	16,299	433	$4,401,000	$5,878,000	$854,000	$1,972
Bertram	1,078	38	$291,000	$388,000	$56,000	$1,466
Blanco	807	17	$218,000	$291,000	$43,000	$2,558
Buda (p)	13,912	367	$3,756,000	$5,017,000	$729,000	$1,987
Burnet	4,540	147	$1,226,000	$1,638,000	$238,000	$1,614
Cedar Park (p)	4,174	127	$1,127,000	$1,505,000	$219,000	$1,720
Columbus	1,535	66	$414,000	$553,000	$80,000	$1,219
Cottonwood Shores	781	20	$210,000	$281,000	$41,000	$2,069
County-Other, Bastrop	6,471	172	$1,747,000	$2,333,000	$339,000	$1,973
County-Other, Burnet	7,212	158	$1,947,000	$2,601,000	$378,000	$2,390
County-Other, Travis (Aqua Texas - Rivercrest)	258	16	$70,000	$93,000	$14,000	$897
Creedmoor-Maha WSC	3,325	50	$898,000	$1,199,000	$174,000	$3,452
Cypress Ranch WCID 1	595	8	$161,000	$215,000	$31,000	$3,804
Dripping Springs WSC	14,123	360	$3,813,000	$5,094,000	$740,000	$2,056
Elgin	14,272	285	$3,853,000	$5,147,000	$747,000	$2,619

WUG	Smart Meters Installed by 2070	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Fayette County WCID Monument Hill	334	12	$90,000	$120,000	$17,000	$1,447
Flatonia	788	24	$213,000	$285,000	$41,000	$1,745
Fredericksburg	5,356	216	$1,446,000	$1,932,000	$281,000	$1,300
Georgetown (p)	232	8	$63,000	$84,000	$12,000	$1,600
Goldthwaite	825	23	$223,000	$298,000	$43,000	$1,907
Hays County WCID 1	1,216	40	$328,000	$438,000	$64,000	$1,606
Hays County WCID 2	1,244	42	$336,000	$449,000	$66,000	$1,564
Horseshoe Bay	2,671	181	$721,000	$963,000	$140,000	$773
Hurst Creek MUD	1,032	85	$279,000	$373,000	$54,000	$636
Johnson City	784	19	$212,000	$283,000	$41,000	$2,116
Jonestown WSC	1,414	35	$382,000	$510,000	$73,000	$2,089
Kelly Lane WCID 1	564	16	$152,000	$203,000	$29,000	$1,865
Kempner WSC (p)	309	8	$83,000	$112,000	$17,000	$2,194
La Grange	2,170	54	$586,000	$782,000	$113,000	$2,100
Lago Vista	4,740	171	$1,280,000	$1,710,000	$248,000	$1,447
Lakeway MUD	5,088	161	$1,374,000	$1,835,000	$266,000	$1,657
Llano	1,314	46	$355,000	$474,000	$68,000	$1,490
Loop 360 WSC	852	74	$230,000	$307,000	$45,000	$606
Marble Falls	8,247	322	$2,227,000	$2,975,000	$432,000	$1,340
Matagorda Waste Disposal & WSC	264	7	$71,000	$95,000	$14,000	$2,044
Meadowlakes	847	42	$229,000	$306,000	$44,000	$1,054
North San Saba WSC	234	10	$63,000	$84,000	$12,000	$1,231
Oak Shores Water System	211	8	$57,000	$76,000	$11,000	$1,302
Pflugerville (p)	19,335	471	$5,220,000	$6,973,000	$1,013,000	$2,149
Richland SUD (p)	346	12	$93,000	$124,000	$18,000	$1,532
Rollingwood	486	19	$131,000	$175,000	$25,000	$1,326
Rough Hollow in Travis County	1,899	61	$513,000	$685,000	$99,000	$1,632
Round Rock (p)	172	4	$46,000	$62,000	$9,000	$2,250
San Saba	1,224	62	$331,000	$442,000	$64,000	$1,031

WUG	Smart Meters Installed by 2070	Maximum Water Reduction (ac-ft)	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Schulenburg	1,497	48	$404,000	$539,000	$78,000	$1,628
Senna Hills MUD	698	35	$188,000	$252,000	$37,000	$1,045
Shady Hollow MUD	1,455	37	$393,000	$525,000	$76,000	$2,029
Smithville	2,507	61	$677,000	$904,000	$131,000	$2,152
Sunset Valley	643	38	$174,000	$232,000	$33,000	$876
Travis County MUD 10	199	6	$54,000	$72,000	$10,000	$1,613
Travis County MUD 4	1,421	130	$384,000	$513,000	$74,000	$569
Travis County WCID 10	3,720	251	$1,004,000	$1,341,000	$194,000	$772
Travis County WCID 17	15,708	592	$4,241,000	$5,665,000	$823,000	$1,390
Travis County WCID 18	1,944	47	$525,000	$701,000	$102,000	$2,173
Travis County WCID 19	227	22	$61,000	$81,000	$12,000	$541
Travis County WCID 20	377	29	$102,000	$137,000	$20,000	$693
Travis County WCID Point Venture	867	31	$234,000	$312,000	$45,000	$1,442
Weimar	867	28	$234,000	$312,000	$45,000	$1,582
West Travis County Public Utility Agency	19,637	1025	$5,302,000	$7,083,000	$1,028,000	$1,003
Wharton	3,887	98	$1,050,000	$1,403,000	$204,000	$2,087
Wharton County WCID 2	922	27	$249,000	$333,000	$48,000	$1,794
Windermere Utility	3,135	74	$847,000	$1,130,000	$164,000	$2,218

(p) - demands and potential savings shown are only for the portion of the WUG that lies within the Region K boundaries
Note: Lakeway MUD requested 5,088 connections.

The Texas Water Development Board (TWDB) Cost Estimating Tool methodology was used to determine facility costs, project costs, annual costs, and unit costs. A 10% operations and maintenance (O&M) cost was included in annual costs for smart meters, but no O&M was included for leak detection and repair because there should be no additional O&M costs for replacing an existing pipe. The unit cost is presented as an average, with some conservation measures being more expensive and some being less.

Remaining conservation measures were assumed to be non-capital approaches, which could include both labor and materials associated with implementing standards, incentives, and education and outreach. Conservation measures for non-capital approaches were included in the annual costs at an average of $250/ac-ft of water savings. The following table provides the total cost information for WUGs with a recommended conservation strategy, including both capital and non-capital costs.

Table 5.11: Municipal Conservation Total Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC	Bastrop	Brazos	$106,145	$141,784	$12,899	$3,167
Aqua WSC	Bastrop	Colorado	$10,642,081	$14,215,166	$1,293,285	$3,167
Aqua WSC	Bastrop	Guadalupe	$75,130	$100,355	$9,130	$3,167
Bastrop	Bastrop	Colorado	$6,219,000	$8,306,000	$1,099,750	$1,109
County-Other	Bastrop	Brazos	$18,726	$25,012	$2,992	$1,264
County-Other	Bastrop	Colorado	$3,013,372	$4,024,942	$481,475	$1,264
County-Other	Bastrop	Guadalupe	$74,902	$100,046	$11,968	$1,264
Elgin	Bastrop	Colorado	$4,632,600	$6,187,793	$845,784	$1,208
Smithville	Bastrop	Colorado	$1,078,802	$1,440,741	$169,086	$1,736
Blanco	Blanco	Guadalupe	$1,272,212	$1,700,238	$141,621	$5,265
Johnson City	Blanco	Colorado	$847,656	$1,131,823	$100,911	$3,255
Bertram	Burnet	Brazos	$650,000	$868,000	$138,895	$541
Burnet	Burnet	Brazos	$12,414	$16,586	$2,247	$684
Burnet	Burnet	Colorado	$3,061,586	$4,090,414	$554,098	$684
Cottonwood Shores	Burnet	Colorado	$621,371	$830,020	$79,616	$2,512
County-Other	Burnet	Brazos	$1,278,074	$1,706,998	$190,241	$2,090
County-Other	Burnet	Colorado	$2,276,077	$3,039,935	$338,794	$2,090
Georgetown	Burnet	Brazos	$434,000	$579,000	$54,225	$1,326
Horseshoe Bay	Burnet	Colorado	$2,005,407	$2,678,580	$349,543	$542
Kempner WSC	Burnet	Brazos	$388,291	$519,566	$45,077	$3,635
Marble Falls	Burnet	Colorado	$5,075,000	$6,780,000	$1,212,605	$473
Meadowlakes	Burnet	Colorado	$1,277,000	$1,706,000	$219,600	$582
Columbus	Colorado	Colorado	$1,617,000	$2,160,000	$311,915	$537
Weimar	Colorado	Colorado	$295,597	$394,677	$44,928	$849
Weimar	Colorado	Lavaca	$605,403	$808,323	$92,017	$849
Fayette County WCID Monument Hill	Fayette	Colorado	$216,000	$288,000	$43,725	$563
Flatonia	Fayette	Guadalupe	$156,147	$208,573	$21,569	$1,154
Flatonia	Fayette	Lavaca	$671,853	$897,427	$92,806	$1,154
La Grange	Fayette	Colorado	$1,974,236	$2,637,312	$244,072	$2,835

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Schulenburg	Fayette	Lavaca	$1,343,000	$1,794,000	$210,315	$828
Fredericksburg	Gillespie	Colorado	$5,597,000	$7,476,000	$1,035,160	$574
Buda	Hays	Colorado	$5,144,000	$6,871,000	$910,515	$1,148
Dripping Springs WSC	Hays	Colorado	$5,710,084	$7,627,247	$917,658	$1,593
Hays County WCID 1	Hays	Colorado	$1,359,000	$1,815,000	$201,585	$892
Hays County WCID 2	Hays	Colorado	$772,000	$1,032,000	$154,795	$598
West Travis County Public Utility Agency	Hays	Colorado	$7,121,797	$9,512,948	$1,940,936	$401
Horseshoe Bay	Llano	Colorado	$3,109,593	$4,153,420	$542,002	$542
Llano	Llano	Colorado	$1,961,000	$2,619,000	$274,415	$931
Matagorda Waste Disposal & WSC	Matagorda	Brazos-Colorado	$308,595	$412,260	$32,505	$5,140
Matagorda Waste Disposal & WSC	Matagorda	Colorado	$462,405	$617,740	$48,705	$5,140
Goldthwaite	Mills	Brazos	$23,790	$31,780	$3,002	$1,800
Goldthwaite	Mills	Colorado	$896,210	$1,197,220	$113,103	$1,800
North San Saba WSC	San Saba	Colorado	$1,588,000	$2,122,000	$172,325	$2,030
Richland SUD	San Saba	Colorado	$509,000	$680,000	$70,350	$974
San Saba	San Saba	Colorado	$2,119,000	$2,830,000	$346,105	$623
Aqua WSC	Travis	Colorado	$1,276,634	$1,705,264	$155,144	$3,167
Barton Creek West WSC	Travis	Colorado	$332,000	$444,000	$82,635	$429
Barton Creek WSC	Travis	Colorado	$715,000	$956,000	$162,465	$397
Cedar Park	Travis	Colorado	$2,944,000	$3,932,000	$486,705	$824
County-Other, Travis (Aqua Texas - Rivercrest)	Travis	Colorado	$824,000	$1,100,000	$114,185	$806
Creedmoor-Maha WSC	Travis	Colorado	$1,720,779	$2,297,818	$252,469	$2,506
Creedmoor-Maha WSC	Travis	Guadalupe	$110,221	$147,182	$16,171	$2,506
Cypress Ranch WCID 1	Travis	Colorado	$370,000	$494,000	$53,040	$2,502
Elgin	Travis	Colorado	$705,400	$942,207	$128,786	$1,208

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Hurst Creek MUD	Travis	Colorado	$779,000	$1,041,000	$260,970	$336
Jonestown WSC	Travis	Colorado	$1,872,747	$2,502,106	$213,821	$3,825
Kelly Lane WCID 1	Travis	Colorado	$510,000	$681,000	$69,655	$1,353
Lago Vista	Travis	Colorado	$5,068,000	$6,769,000	$834,940	$697
Lakeway MUD	Travis	Colorado	$3,435,000	$4,588,000	$688,130	$588
Loop 360 WSC	Travis	Colorado	$600,000	$801,000	$220,130	$324
Oak Shores Water System	Travis	Colorado	$178,000	$237,000	$36,095	$516
Pflugerville	Travis	Colorado	$7,340,224	$9,804,939	$1,212,082	$1,607
Rollingwood	Travis	Colorado	$616,000	$822,000	$100,560	$678
Rough Hollow in Travis County	Travis	Colorado	$1,417,000	$1,892,000	$239,590	$750
Round Rock	Travis	Colorado	$52,255	$69,787	$9,532	$1,489
Senna Hills MUD	Travis	Colorado	$340,000	$454,000	$116,965	$365
Shady Hollow MUD	Travis	Colorado	$848,000	$1,132,000	$126,595	$1,402
Sunset Valley	Travis	Colorado	$416,000	$556,000	$126,640	$369
Travis County MUD 10	Travis	Colorado	$196,000	$261,000	$28,120	$925
Travis County MUD 4	Travis	Colorado	$2,051,000	$2,740,000	$478,490	$399
Travis County WCID 10	Travis	Colorado	$3,368,000	$4,498,000	$884,280	$389
Travis County WCID 17	Travis	Colorado	$12,180,000	$16,270,000	$2,444,905	$549
Travis County WCID 18	Travis	Colorado	$1,141,381	$1,524,479	$159,888	$2,129
Travis County WCID 19	Travis	Colorado	$140,000	$187,000	$60,795	$300
Travis County WCID 20	Travis	Colorado	$435,000	$582,000	$105,260	$400
Travis County WCID Point Venture	Travis	Colorado	$567,000	$757,000	$117,545	$544
West Travis County Public Utility Agency	Travis	Colorado	$6,665,203	$8,903,052	$1,816,499	$401
Windermere Utility	Travis	Colorado	$1,691,955	$2,259,450	$243,738	$2,060
Wharton	Wharton	Brazos-Colorado	$1,927,148	$2,574,480	$240,371	$2,655

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Wharton	Wharton	Colorado	$1,576,852	$2,106,520	$196,679	$2,655
Wharton County WCID 2	Wharton	Brazos-Colorado	$1,007,000	$1,345,000	$133,650	$1,318

Environmental Considerations

Conservation has potential impacts for WUGs that are served by groundwater. Communities that are served by surface water will divert less water from streams, meaning more water will remain in channels for downstream uses. However, groundwater communities contribute to streamflow by discharging treated groundwater into streams (typically 60 percent of water supplied is discharged following treatment). Conservation measures implemented by these WUGs may lead to an overall decrease in streamflow which is derived from groundwater sources. However, streamflow would not be expected to be decreased if the conservation is in the outdoor irrigation usage sector. Individual WUG implementation has negligible impacts to the region, but full regional implementation could leave up to approximately 40,000 ac-ft/yr in the lakes and aquifers. This additional water would increase storage levels, delay drought triggers, and increase springflows.

5.2.2.4 *Mining Conservation*

Mining conservation is being considered as a strategy to meet certain mining needs in Bastrop and Burnet Counties. Conservation for mining involves taking the existing pumped groundwater, once used, letting it settle, and then recycling it for additional use rather than pumping additional groundwater from the aquifer.

This strategy assumes that the existing supply can be recycled up to five times, as needed, in order to meet the mining demands. Mining in Burnet County has additional groundwater strategies providing supply, but there is no additional groundwater available under the MAG to meet the mining water needs in Bastrop County, Guadalupe Basin.

Table 5.12 provides the conservation savings yield from recycling the existing water supply.

Table 5.12: Mining Conservation Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Bastrop	Guadalupe	2	243	308	233	0	0
Mining	Burnet	Colorado	1,300	1,300	1,300	1,300	1,300	1,800

Cost Implications of Proposed Strategy

It is assumed that there are no facilities' costs for this strategy. Energy costs for recycling the water were calculated using the TWDB Costing Tool.

Table 5.13: Mining Conservation Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Mining	Bastrop	Guadalupe	$0	$0	$5,000	$16
Mining	Burnet	Colorado	$0	$0	$60,000	$33

Agricultural & Natural Resources Considerations

Negligible impacts to the environment and agriculture are expected.

5.2.2.5 Irrigation Conservation

Several types of conservation measures are recommended to meet Irrigation needs, specifically in Colorado, Matagorda, and Wharton counties. The following sections describe the recommended measures in more detail.

5.2.2.5.1. On-Farm Conservation

The water needed for irrigation in Colorado, Wharton, and Matagorda counties is the largest deficit identified within the LCRWPA. On-farm water conservation for irrigation is one of the water management strategies developed to address the issue.

Analysis

It is anticipated that significant water savings can be achieved using precision land leveling (including levees), multiple field inlets, and irrigation pipeline. The estimated amount of water savings from on-farm water conservation accomplished from 2011 to 2018 is substantial with more than 48,000 acres of land leveled and over 200,000 feet of irrigation pipeline installed during that timeframe. The majority of these improvements were made in Colorado County, likely due to the fact that since from 2012-2015, the only irrigation division receiving water from the Colorado River was Garwood, which is 80 percent in Colorado County. However, for many years there has been low participation in Matagorda County, so for maximum water savings to be realized, participation in NRCS’s Environmental Quality Incentives Program (EQIP) in Matagorda County must increase substantially.

The conservation estimate was based on updated estimates of total rice acreage available for improvement in each county from the USDA/NASS 2017 Census of Agriculture and the NRCS EQIP Conservation Applied Practices by County 2018. The estimate assumes that the average annual improvement of land leveling will continue in Matagorda (~440 ac/yr) and Wharton Counties (~790 ac/yr) and 50 percent of unimproved acreage will be improved in Colorado County through 2070. It also assumes 50 percent adoption of multiple inlets and 25 percent adoption of irrigation pipeline, based on current unimproved acreage for each county. *Table 5.14* shows unimproved acreage in Colorado, Matagorda, and Wharton counties.

Table 5.14: Unimproved Acreage

County	Cropland[1]	Est. Acres in Use Per Year[2]	Conservation Applied[3] (acres)	Unimproved Land	Unimproved Land Available to Save Water
Colorado	135,012	31%	30,098	104,914	33,026
Matagorda	176,443	67%	7,122	169,321	54,183
Wharton (K)	217,873	71%	15,836	202,037	142,803

[1] USDA/NASS 2017 Census of Agriculture (Land in farms – Cropland)
[2] 2017 NASS Planted Acres (Total planted acres/Cropland)
[3] NRCS EQIP Conservation Applied Practices by County 2018

Rice utilizes significantly more water than many other Texas crops because of the growing environment adopted for rice production. Rice is grown in standing water primarily due to the plant's requirement for saturated soil moisture conditions during most of its vegetative and reproductive stages, and secondarily to minimize competition from undesirable plants. The flood culture is not required to grow rice but is currently the only practical method for maintaining the required saturated soil conditions.

There are many potential on-farm irrigation improvements, but in general, water savings can best be achieved by minimizing flooding depth and improving management of the flushing and flooding operations. The techniques that have the most significant impact in accomplishing these goals include precision or laser land leveling, use of permanent levees with permanent water control structures, use of a field lateral with multiple field inlets, and improved management of water control activities. Individual water conservation measures are discussed in the following sections.

Table 5.15: On-Farm Conservation Estimate of Water Savings

WUG	County	Basin	On-Farm Conservation Estimate of Water Savings (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	2,206	2,647	3,088	3,529	3,971	4,412
Irrigation	Colorado	Colorado	685	823	960	1,097	1,234	1,371
Irrigation	Colorado	Lavaca	2,769	3,322	3,876	4,430	4,984	5,537
Irrigation	Matagorda	Brazos-Colorado	2,536	3,043	3,550	4,058	4,565	5,072
Irrigation	Matagorda	Colorado	21	25	29	33	38	42
Irrigation	Matagorda	Colorado-Lavaca	2,489	2,987	3,484	3,982	4,480	4,978
Irrigation	Wharton	Brazos-Colorado	7,795	9,354	10,913	12,472	14,031	15,590
Irrigation	Wharton	Colorado	3,553	4,263	4,974	5,685	6,395	7,106
Total			**22,054**	**26,464**	**30,874**	**35,286**	**39,698**	**44,108**

Note: Demand reductions through advanced conservation were distributed to county-basin irrigation WUGs based on the location of shortages.

Laser Land Leveling

In the production of rice, there are many benefits to having fields that are almost level but still have some slope for drainage, typically 0.15 foot or less in elevation change for 100 feet of distance. An almost level field will allow a more uniform shallow water depth across the field, reducing the total amount of water applied to the field. Land grading can give a field this desired condition by using a laser-guided grader equipped with GPS.

Precision land leveling or can reduce the amount of water used by 25 to 30 percent and increase production by 10 to 15 percent. A 2012 savings verification study prepared for LCRA by the University of Texas LBJ School of Public Affairs[1] found that precision leveling, in and of itself, accounts for a 0.30 ac-ft/ac reduction in on-farm water use for the first crop at a 95 percent confidence interval when compared to water use in unleveled fields. Fields where permanent levees were utilized as part of the precision leveling process saved more water than fields that were just land leveled. Fields that were precision leveled and had some levees removed showed an average savings of 0.70 ac-ft/ac, though this higher estimate is not statistically significant. From 2009 to 2012, this study developed, tested and validated qualitative and statistical methods for evaluating how on-farm water usage varies in LCRA's Lakeside Irrigation Division between fields and between farmers by analyzing water use data from 2006-2011. This study estimates the water savings from precision land leveling, compared to other factors that influence water use. Another savings verification study prepared for LCRA by the University of Wisconsin using 2012-2016 data in the Garwood Irrigation Division found that decreasing the density of levees results in a statistically significant reduction in water use.

Interest in large investments in long-term land improvements such as precision land leveling in the rice industry is greater among those rice growers who own their own land. In that case, improvements benefit the landowner and make sense economically, particularly when there is matching grant money available from the Natural Resources Conservation Service. However, in many cases, land is leased on an annual basis for rice production. There is usually no long-term agreement between the landowner and farmer, although share-renting arrangements are common. A rental-for-cash arrangement makes it difficult for the farmer to justify a significant capital expenditure and can limit the amount of land where precision leveling is being implemented. The topography and soil type also may limit the amount of land where this practice could be implemented.

Levees are used to separate the individual cuts in a rice field. Maintenance of a uniform shallow water depth allows the levees to maintain greater freeboard or levee height above the water surface. If there is insufficient freeboard, rainfall can cause the levees to overtop and fail with the worst-case result being loss of water from the entire field. Minimizing the flooding depth allows the producer to capture rainwater, replacing an equal amount of water that would normally have been diverted from the river or pumped from wells. The amount of water saved can vary with rainfall during the growing season but can replace a significant quantity of the water normally diverted from the river and minimize the amount of tail water or rice field runoff water.

NRCS guidelines require a maximum slope for precision land leveled fields that can vary based on crop and field characteristics. Fields that are improved to a higher standard generally have a smaller average elevation change and between adjacent levees, a smaller overall field slope, and also have levees that are straighter and farther apart from each other, resulting in lower levee density. LCRA savings verification studies conducted in both Lakeside and Garwood irrigation divisions have found that fields with lower levee density use less water. Fewer levees also reduce labor costs required to manage water within a field and can increase production yield.

[1] Ramirez, A.K. and Eaton, D. J. "Statistical Testing for Precision Graded Verification," a report from the University of Texas at Austin to the Lower Colorado River Authority, Austin, TX, September 2012

Permanent Perimeter Levees

Permanent, taller levees can be installed around the perimeter and in the interior of the rice field. Permanent levees can allow a farmer the ability to hold deeper water for the purpose of safely utilizing rainfall without the fear of breaching the smaller, more traditional levees. The permanent levees are much less likely to be damaged or breached by heavy rain events. LCRA savings verification studies have found that the presence of permanent perimeter levees reduces water use.

Use of Multiple Field Inlets

Another method used by rice producers to conserve water is the utilization of multiple field inlets for applying water to the individual cuts or land sections between levees. The use of multiple inlets allows for many benefits that result in water savings. The water savings is further enhanced when multiple inlets are applied in combination with land leveling. Most of the acreage that has been land leveled through EQIP since 2011 had multiple inlets installed as well. Limited funding and increased competitiveness of the EQIP program led many producers to include both practices in their EQIP applications as a means of increasing their chances of having their applications funded. The most significant benefit of multiple inlets is the ability to apply water where and when it is needed and at a shallower depth. Because of the shallow water, rice production is increased while the total water applied is minimized. A side lateral with multiple inlets is often paired with a similar drain, as opposed to draining all water from a field through the lowest cut. This can allow the field to drain more quickly, shortening the time to harvest, preventing runoff of nutrients, and reducing irrigation labor, and increasing the potential for higher production yield of a ratoon crop. A model called Rice Water Conservation Analyzer developed for LCRA in 2008 estimated that multiple inlets save 0.4 ac-ft/ac. This estimate was also published in the 2011 LCRA agricultural water supply resource plan.

Irrigation Pipelines

The practice of replacing on-farm canal ditches with pipeline reduces losses and increases efficiency of water delivery. The decision to line a canal or replace the canal using a pipeline is often made based on how much water is conveyed in the canal and the quality of water in the canal; the smaller the capacity of the canal, the more likely it is a candidate for replacement using a pipeline. PVC Plastic Irrigation Pipe is commonly used in this application and is available in diameters from 6 to 27 inches with pressure ratings from 80 psi to 200 psi. The strategy assumes savings of 0.18 ac-ft/ac, per a series of interviews with L.G. Raun, Jr. and Ronald Gertson.

Cost Implications of Proposed Strategy

The total cost for the on-farm strategies, developed through the Texas Water Development Board (TWDB) Cost Estimating Tool, is $64,153,000. Many of these on-farm conservation strategies are eligible for funding of up to 70 percent through the EQIP program. Funding for this program in the affected Region K counties may be expanded due to a recent federal grant. Individual producers and landowners bear the costs associated with these on-farm strategies except for that portion that may be eligible for reimbursement through EQIP or HB1437 grants. *Table 5.16* shows the cost of the various conservation strategies based on September 2018 costs. *Table 5.17* shows the facilities, project, annual, and unit cost by WUG.

Table 5.16: Estimated Unit Cost of Agricultural Conservation Improvements

Improvement	Improvement Cost per Acre
Precision Land Leveling[1]	$440
Multiple Inlets[1]	$160
Irrigation Pipeline[2]	$241

[1] Texas State Soil & Water Conservation Board, 2019
[2] Interviews with L.G. Raun, Jr. and Ronald Gertson, 2006

Table 5.17: Cost Estimate for On-Farm Conservation

WUG	County	Basin	Total Facilities Cost	Total Project Costs	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Colorado	Brazos-Colorado	$4,625,988	$6,416,809	$497,717	$113
Irrigation	Colorado	Colorado	$1,437,467	$1,993,943	$154,659	$113
Irrigation	Colorado	Lavaca	$5,806,468	$8,054,279	$624,727	$113
Irrigation	Matagorda	Brazos-Colorado	$5,318,274	$7,377,094	$572,201	$113
Irrigation	Matagorda	Colorado	$43,795	$60,749	$4,712	$113
Irrigation	Matagorda	Colorado-Lavaca	$5,219,349	$7,239,873	$561,558	$113
Irrigation	Wharton	Brazos-Colorado	$16,346,846	$22,675,068	$1,758,782	$113
Irrigation	Wharton	Colorado	$7,450,812	$10,335,185	$801,644	$113

Environmental Considerations

On-farm conservation for rice production could influence the instream water balance during dry, summer months in two ways: (1) by reducing the amount of return flows introduced to streams, and (2) by reducing the amount of water diverted from streams. The balance of these two impacts could potentially result in a net gain or loss in dry weather instream flows, depending on the farming practices used. First, the reduced return flows from irrigated fields would negatively impact flows downstream of the fields. These return flows would typically occur during the summer months when this discharge can provide habitat for species and other ecological benefits. However, conservation could have a positive impact on instream flows by reducing the amount of water diverted for irrigation thereby increasing the amount of store water potentially available to meet environmental flow needs over the long term. Overall, it is likely that there would be negligible impacts to streamflow and the bay.

Agricultural & Natural Resources Considerations

On-farm conservation methods have the potential benefit to agriculture in that by reducing the demand for water overall, they increase the likelihood that demands for water could be met on a more consistent basis. In some cases, grant funding and low-interest loan funding availability is critical to local implementation. Impacts to agriculture are mainly cost-related, as shown in *Table 5.17.*

5.2.2.5.2. Irrigation Operations Conveyance Improvements

The water needed for irrigation in Colorado, Wharton, and Matagorda Counties is the largest deficit identified within the LCRWPA. Irrigation operation conveyance improvement is one of the water management strategies identified in LCRA's Agricultural WSRP to address the issue.

Analysis

In addition to the water conservation measures implemented on-farm, substantial water can be saved by improving the efficiency of the canal systems that deliver water to the individual irrigator. These improvements would include: 1) improving the efficiency of water delivery in canal systems by automating the operation of major checks structures within the irrigation division; 2) creating a centralized control system for each irrigation division, allowing each canal system to be monitored and operated remotely; 3) adding flow regulating reservoirs to balance flows; 4) targeted lining of high-loss canal segments; and 5) regular maintenance of canal banks, including vegetation control and repairing sections damaged by cattle and other animals. Since the 2016 Region K plan, all of the main Gulf Coast Irrigation Division gates were automated by LCRA, improving the efficiency of water delivery in canal systems. LCRA plans to automate the main canal structures in all LCRA-controlled canal systems by or before 2030.

Centralized SCADA control is an essential back bone to upgrading the efficiency of water delivery in the canal systems. LCRA is pursuing the development of software to allow downstream control of these gates, which could increase savings substantially by relaying downstream water demand information real-time to upstream gates, rather than simply maintaining a constant upstream level at each site. The combination of centralized control and automation of all major check structures required to operate the system remotely are expected to eliminate 50 to 70 percent of estimated overflows lost from the end of the system, for a savings of 3.5 percent of average historical water use. This savings estimate was developed for upstream control gates. This savings estimate has been corroborated with reduction in overflows from the ends of the canal lines in Gulf Coast, as well as a regression savings analysis comparing predicted water use to actual water diverted, taking into account normal variations due to climate and acreage variability.

The 2008 LSWP PVA estimated 65,000 ac-ft/yr of water savings from improved efficiency of rice irrigation delivery system by the LCRA irrigation divisions in an average scenario. Details of this conservation estimate can be found in a report titled Conservation Strategies in the LCRA Irrigation Divisions – 2007 dated May 23, 2008. Changes to the conservation estimates shown in the table below reflect project implementation.

Table 5.18: Irrigation Operations Conveyance Improvements Estimate of Water Savings

WUG	County	Basin	Irrigation Operations Conveyance Improvements Estimate of Water Savings (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	503	1,145	1,788	2,431	3,074	3,716
Irrigation	Colorado	Colorado	156	356	556	755	955	1,155
Irrigation	Colorado	Lavaca	631	1,438	2,245	3,051	3,858	4,665
Irrigation	Matagorda	Brazos-Colorado	1,471	3,351	5,232	7,112	8,992	10,872
Irrigation	Matagorda	Colorado	12	28	43	59	74	90
Irrigation	Matagorda	Colorado-Lavaca	1,444	3,289	5,134	6,980	8,825	10,670
Irrigation	Wharton	Brazos-Colorado	1,225	2,791	4,357	5,923	7,489	9,055
Irrigation	Wharton	Colorado	558	1,272	1,986	2,700	3,413	4,127
Total			**6,000**	**13,670**	**21,341**	**29,011**	**36,680**	**44,350**

Note: Demand reductions through advanced conservation were distributed to county-basin irrigation WUGs based on the location of shortages.

Cost Implications of Proposed Strategy

The total estimated cost for the irrigation district conveyance improvement strategies recommended in the LCRA's Agricultural Water Supply Resource Plan is $100,980,000. There is currently no mechanism in place to pay for the irrigation conveyance improvements recommended in this plan. *Table 5.19* shows the facilities, project, annual, and unit cost by WUG. The unit cost shown in the table represents an average of more expensive strategies, such as balancing reservoirs, and less expensive options, such as automated canal gates.

Table 5.19: Cost Estimate for Irrigation Operations Conveyance Improvements

WUG	County	Basin	Total Facilities Cost	Total Project Costs	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Colorado	Brazos-Colorado	$6,100,143	$8,461,667	$717,373	$193
Irrigation	Colorado	Colorado	$1,895,543	$2,629,356	$222,915	$193
Irrigation	Colorado	Lavaca	$7,656,805	$10,620,953	$900,436	$193
Irrigation	Matagorda	Brazos-Colorado	$17,846,571	$24,755,443	$2,098,746	$193
Irrigation	Matagorda	Colorado	$146,964	$203,857	$17,283	$193
Irrigation	Matagorda	Colorado-Lavaca	$17,514,606	$24,294,966	$2,059,707	$193
Irrigation	Wharton	Brazos-Colorado	$14,862,921	$20,616,745	$1,747,870	$193
Irrigation	Wharton	Colorado	$6,774,447	$9,397,011	$796,671	$193

Environmental Impact

The improvement of existing irrigation conveyances that provide water to farms will allow for customers to be served with fewer losses in transmission. This will result in a reduced overall demand for water and will reduce the volume of diversions that will have to be dedicated to maintaining flow in canals. If fully implemented, impacts to streamflows and the bay are approximately 50% of the conservation savings, or up to 22,175 ac-ft/yr by 2070.

Agricultural & Natural Resources Considerations

Irrigation conveyance improvement conservation methods have the potential benefit to agriculture in that by reducing the demand for water overall, they increase the likelihood that demands for water could be met on a more consistent basis. Impacts to agriculture are mainly cost-related, as shown in *Table 5.19.*

5.2.2.5.3. Sprinkler Irrigation

An additional form of conservation that farmers could undertake to reduce water demands when growing rice involves converting the method used from field flooding to sprinkler irrigation. The following is an excerpt from the Texas Rice Producers Legislative Group's supporting documentation for submittal of an ETF grant application, provided by Ronald Gertson. The excerpt has been slightly modified from its original form.

Analysis

In South America and the US Midwest, rice growers have had moderate success in growing rice under sprinkler irrigation. New technologies need to be demonstrated and adopted for rice farmers to decrease annual water use while maintaining profitable production. Pivot/linear-move sprinkler shows great promise as being an economic alternative to flood irrigation with much lower water use. The development of these alternative systems while maintaining a saturated soil environment to allow maximum yields and restrict weed growth is key for rice growing. Water use efficiency in rice is focused on having an effective water delivery system and optimizing grower water management decision-making.

The primary concept being deployed in this investigation is the use of sprinkler-delivered irrigation water as a means of both eliminating the standard two-to-four flushing periods at the beginning of the growing season and as a means of shortening the duration of the traditional flood irrigation period. Flushing is the standard method for maintaining soil moisture during the early growing season when rice plants are not sufficiently mature to thrive in a flood culture. A flush is essentially a temporary flood in which water is moved through the field by gravity. Each flush results in the loss of considerable tailwater as water is removed from the field. One flush uses 5-to-7 inches of water, while a sprinkler could efficiently accomplish the needed field wetting with the application of only 1-to-2 inches, yielding a water use reduction of 4-to-5 inches per flush. A number of commonly used weed herbicides in rice require water applications for maximum effectiveness. Timely sprinkler applications for the activation of these herbicides offers some hope for reducing weed pressures early thereby potentially enabling the delay of the permanent flood and therefore reducing the period that flood waters are lost to direct evaporation.

Weed control has been the major limiting factor in the use of sprinkler technology in rice production. LEPA (low elevation precision application) is one of the most efficient irrigation technologies. LEPA discharges water from very low hanging and closely spaced nozzles, which may enhance weed control in comparison to other sprinkler irrigation. LEPA also makes possible the elimination of water application to the panicles of mature rice plants (as occurs with traditional impact sprinkler nozzles). This should greatly reduce the fissuring of rice grains which often occurs with the use of sprinkler irrigation in rice.

Table 5.20 provides the potential water savings for each WUG by implementing sprinkler irrigation as a strategy. An assumed water savings of eight (8) inches per acre, or 0.67 ac-ft/ac, was used for the calculation. The number of acres was determined by looking at the total number of acres planted for first crop rice in 2011 in the LCRA Irrigation Districts. This total acreage was used because it was part of the methodology used to calculate the Irrigation Demand Projections for Colorado, Matagorda, and Wharton counties, as documented in the agriculture projection memo included in Appendix 2C of the 2021 Region K Water Plan. Only acres using surface water were assumed, as surface water is more likely to be restricted during drought years, and surface water users may be more likely to convert to sprinkler irrigation. The percent of acres this strategy is assumed to be applied to ranges from 2% in 2020 up to 25% in 2050 and beyond. For Colorado County, this assumes 6,749 acres are converted by 2050; for Matagorda County, this assumes 4,213 acres are converted by 2050; and for Wharton County, this assumes 6,129 acres are converted by 2050.

Table 5.20: Sprinkler Irrigation Estimate of Water Savings

WUG	County	Basin	Sprinkler Irrigation Estimate of Water Savings (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	140	701	1,403	1,753	1,753	1,753
Irrigation	Colorado	Colorado	44	218	436	545	545	545
Irrigation	Colorado	Lavaca	176	880	1,761	2,201	2,201	2,201
Irrigation	Matagorda	Brazos-Colorado	113	565	1,129	1,412	1,412	1,412
Irrigation	Matagorda	Colorado	1	5	9	12	12	12
Irrigation	Matagorda	Colorado-Lavaca	111	554	1,108	1,385	1,385	1,385
Irrigation	Wharton	Brazos-Colorado	225	1,123	2,245	2,807	2,807	2,807
Irrigation	Wharton	Colorado	102	512	1,023	1,279	1,279	1,279
Total			**912**	**4,558**	**9,114**	**11,394**	**11,394**	**11,394**

Note: Demand reductions through advanced conservation were distributed to county-basin irrigation WUGs based on the location of shortages.

Cost Implications of Proposed Strategy

Costs for the strategy were assumed using a study performed for Region A on water management strategies for reducing irrigation demands. The cost for converting to sprinkler irrigation, updated to September 2018 dollars, was $499/acre modified. Project costs, annual costs, and unit costs were determined using the TWDB Cost Estimating Tool methodology. It was assumed that operations and maintenance would be greater due to an increased production cost, as irrigators using sprinkler irrigation must control for grass and weeds. *Table 5.21* shows the breakdown of cost by WUG.

Table 5.21: Cost Estimate for Sprinkler Irrigation

WUG	County	Basin	Total Facilities Cost	Total Project Costs	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Colorado	Brazos-Colorado	$1,312,346	$1,820,452	$324,877	$185
Irrigation	Colorado	Colorado	$407,795	$565,682	$100,952	$185
Irrigation	Colorado	Lavaca	$1,647,236	$2,285,003	$407,781	$185
Irrigation	Matagorda	Brazos-Colorado	$1,056,492	$1,465,538	$261,540	$185
Irrigation	Matagorda	Colorado	$8,700	$12,068	$2,154	$185
Irrigation	Matagorda	Colorado-Lavaca	$1,036,840	$1,438,278	$256,675	$185
Irrigation	Wharton	Brazos-Colorado	$2,100,571	$2,913,857	$520,006	$185
Irrigation	Wharton	Colorado	$957,430	$1,328,122	$237,016	$185

Environmental Considerations

This type of irrigation will reduce the flooding in the fields that is released as return flows. If fully implemented, during non-drought years, impacts of reduction to streamflows and the bay are approximately 100% of the conservation savings, or up to 11,393 ac-ft/yr by 2070. During drought years, water for irrigation may not be available without implementation of this strategy, which would allow this strategy to provide a positive return flow to the streams and bay.

Agricultural & Natural Resources Considerations

The proposed strategy replaces the method of water supply to rice field. No impact is expected as a result of this strategy. One of the important considerations is whether irrigators have the ability to pay for the improvements. Grant funding and low-interest loan funding availability is a critical factor in local implementation. Impacts to agriculture are mainly cost-related, as shown above in *Table 5.21*.

<u>5.2.2.5.4. Real-Time Use Metering and Monitoring</u>

The water needed for irrigation in Colorado, Wharton, and Matagorda counties is the largest deficit identified within the LCRWPA. Real-time use metering and monitoring for irrigation is one of the water management strategies developed to address the issue.

Analysis

Real-time monitoring involves the installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals. These meters are equipped with sensors that use continuous wave Doppler ultrasound to measure the speed of dirt, bubbles and other particles in the stream flow. Water providers and users are able to accurately quantify the usage, generating awareness of consumption and cost, thereby improving irrigation efficiency and providing a water savings.

In 2015, the Gulf Coast Water Authority (GCWA) received a $200,000 grant from the TWDB's Agricultural Water Conservation Grants Program for the installation of real-time water use monitoring equipment and implementation of conservation pricing. From 2016 to 2018, this project estimated an annual 34 percent water savings rate. According to the GCWA, these savings may be attributed to: 1) generally wetter conditions during the irrigation season, 2) effective measures by irrigators in lowering irrigation water usage, 3) incentivizing water conservation through direct invoicing based on irrigation meter data, and 4) incentivizing water conservation through a tiered pricing structure based on the metered usage per certified acre. Prior to this project, water use was estimated and billed based on the irrigated acres for first and second crop and water attributed to field flushing.

Currently, within LCRA irrigation divisions, surface water use is measured once daily using a volumetric probe, and total use is calculated for each field. LCRA staff controls adjustments to the water flow into each field turnout. These surface water users already implement volumetric billing, as well as a tiered pricing structure, accounting for 0.3 ac-ft/ac water saved. The difference in first crop water demand between GCWA and the LCRA's Gulf Coast Irrigation Division in 2017 and 2018 was 0.54 ac-ft/ac. Access to real-time water consumption data would lead to additional savings from increased precision of water deliveries, decreased leakage rates at turnouts, and more precise management of water use by farmers for irrigation scheduling.

This strategy assumes meters with real-time monitoring capabilities will be installed throughout rice farms in the irrigation divisions in the lower part of the Lower Colorado Regional Water Planning Area (LCRWPA). The estimated savings, shown in *Table 5.22*, assumes these meters save 0.3 ac-ft/ac.

Table 5.22: Real-Time Use Metering and Monitoring Estimate of Water Savings

WUG	County	Basin	Real-Time Use Metering and Monitoring Estimate of Water Savings (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	3,156	3,071	2,989	2,908	2,830	2,754
Irrigation	Colorado	Colorado	981	954	929	904	879	856
Irrigation	Colorado	Lavaca	3,961	3,855	3,751	3,650	3,552	3,457
Irrigation	Matagorda	Brazos-Colorado	2,541	2,472	2,406	2,341	2,278	2,217
Irrigation	Matagorda	Colorado	21	20	20	19	19	18
Irrigation	Matagorda	Colorado-Lavaca	2,494	2,426	2,361	2,298	2,236	2,176
Irrigation	Wharton	Brazos-Colorado	5,052	4,916	4,784	4,655	4,530	4,408
Irrigation	Wharton	Colorado	2,303	2,241	2,180	2,122	2,065	2,009
Total			**20,509**	**19,955**	**19,420**	**18,897**	**18,389**	**17,895**

Note: Demand reductions through advanced conservation were distributed to county-basin irrigation WUGs based on the location of shortages.

Cost Implications of Proposed Strategy

The cost of the meter and installation used by the GCWA grant averages $6,000 each. It is estimated that about 3,000 meters would be required to serve the rice farming areas in Colorado, Matagorda, and Wharton Counties, as this strategy has not been implemented on a large scale. Both Lower Neches Valley Authority and GCWA purchased additional sensors ($1,600-$1,800 each) that remain buried at certain turnout structures to allow the data logger portion of the meter to be moved and connected to the sensors each season as field are rotated. On average, 1,200 turnouts are in service yearly in LCRA's irrigation divisions.

Project costs, annual costs, and unit costs were determined using the TWDB Cost Estimating Tool and proportionally split. Project and annual cost assumptions included administrative and design costs, interest, and debt service. *Table 5.23* shows the breakdown of cost by WUG. Facilities costs shown are associated with the maximum demand reduction volume listed.

Table 5.23: Cost Estimate for Real-Time Use Metering and Monitoring

WUG	County	Basin	Total Facilities Cost	Total Project Costs	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Colorado	Brazos-Colorado	$2,770,152	$3,842,663	$325,801	$103
Irrigation	Colorado	Colorado	$860,790	$1,194,059	$101,238	$103
Irrigation	Colorado	Lavaca	$3,477,052	$4,823,251	$408,940	$103
Irrigation	Matagorda	Brazos-Colorado	$2,230,086	$3,093,501	$262,283	$103
Irrigation	Matagorda	Colorado	$18,364	$25,474	$2,160	$103
Irrigation	Matagorda	Colorado-Lavaca	$2,188,604	$3,035,959	$257,404	$103
Irrigation	Wharton	Brazos-Colorado	$4,433,970	$6,150,655	$521,484	$103
Irrigation	Wharton	Colorado	$2,020,982	$2,803,438	$237,690	$103

Environmental Considerations

Due to more efficient practices, the reduction of tailwater would allow for less water to be recovered. Impacts to return flows would be negligible as this strategy's savings are based on demand reduction.

Agricultural & Natural Resources Considerations

With an increased awareness of consumption and cost that the meters provide, the strategy could be expanded and integrated with canal systems, providing further savings. As the limiting factor in agriculture in the LCRWPA is water availability, generating a more accurate estimate of water use would reduce the water per acre required. During times of non-drought, this would allow farmers to increase production acres and grow more.

5.2.2.5.5. Drip Irrigation

Per the Natural Resources Conservation Service (NRCS), drip irrigation is a micro irrigation method to apply water to the root zone of crops through low pressure, low volume devices. Water is supplied through small diameter pipelines with emitters located close to ground-level. As the emitters have very small discharge openings that are easily clogged, all systems require clean water. A drip irrigation system using groundwater may require a fine mesh screen filter and a centrifugal sand separator, while a system using surface water may require a sand filter to remove sediment, algae, and other impurities.

These systems are ideal for many vegetable and flower crops as well as orchards and vineyards. Drip irrigation systems are efficient, easy to install, and not affected by wind. The conservation features of drip irrigation come from the precise application of water and minimal runoff, less evaporation from an essentially closed system, and less water lost to weeds and undesirable plants. Kansas State University research shows possible irrigation water savings of as much as 25 percent.[2] In the year 2000, micro irrigation amounted to approximately 1.2 percent of the acres irrigated in the state of Texas.

This strategy is applied to Irrigation in Mills, Gillespie, and San Saba Counties. Irrigation in Mills County demonstrates a need, and representatives from Gillespie and San Saba Counties requested consideration of this strategy. Water savings is shown in *Table 5.24*. Applied water savings of drip irrigation application is assumed to be 25 percent.

The *2017 Census of Agriculture* by the National Agricultural Statistics Service (NASS) determined the total cropland in Mills County. As crop rotation is practiced in the Lower Colorado Regional Water Planning Area (LCRWPA), the NASS Planted Acres 2017 provided a percentage of cropland in use per year. Total estimated savings assumes 5 percent of non-rice cropland in use (515 acres) will be improved with drip irrigation systems in Mills County. These crops include wheat/oats and pecans, which require 2.13 ac-ft/ac and 5.00 ac-ft/ac of water, respectively.

Hill Country Underground Water Conservation District provided the planted acreage of vineyards in Gillespie County (750 acres). Total estimated savings assumes 5 percent of land (38 acres) will be improved with drip irrigation systems. According to Texas A&M AgriLife, grapes require 2.00 ac-ft/ac of water.

The *2017 Census of Agriculture* by the NASS determined the total acreage of planted pecans in San Saba County (10,017 acres). Total estimated savings assumes 5 percent of land in use (501 acres) will be improved with drip irrigation systems. Pecan growth typically requires 5.00 ac-ft/ac of water.

Table 5.24: Drip Irrigation Estimate of Water Savings

WUG	County	Basin	Drip Irrigation Estimate of Water Savings (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Mills	Brazos	459	459	459	459	459	459
Irrigation	Gillespie	Colorado	28	28	28	28	28	28
Irrigation	San Saba	Colorado	626	626	626	626	626	626
Total			**1,113**	**1,113**	**1,113**	**1,113**	**1,113**	**1,113**

The strategy of drip irrigation was considered in the lower basin of the LCRWPA, including Colorado, Wharton, and Matagorda counties, but it was not found to be feasible. These counties are large producers of rice, and as rice is often grown in standing water due to the plant's requirement for saturated soil moisture conditions during most of its vegetative and reproductive stages, drip irrigation is not recommended for rice farming.

Cost Implications of Proposed Strategy

Drip irrigation requires a high level of management and maintenance. Filters need to be cleaned and lines should be flushed on a regular basis. Algae and bacteria growth in the lines can be controlled by periodic

[2] Lamm, F. R., H. L. Manges, L. R. Stone, A. H. Khan, and D. H. Rogers. "Water requirement of subsurface drip-irrigated corn in northwest Kansas." *Transactions of the ASAE*. 38 (2): 441-448. 1995.

injections of chlorine into the system, while build-up of mineral deposits such as iron, calcium, or magnesium can be controlled by periodic injections of a mild acid solution.

Micro-irrigation can be the most efficient form of irrigation and typically requires the most capital expense per acre of irrigated land. Per the 2004 Texas Water Development Board (TWDB) Report 362, installation costs range from $800 to $1,200/ac. Project costs, annual costs, and unit costs were determined using the TWDB Cost Estimating Tool in September 2018 dollars. For planning purposes, the LCRWPG assumed a facilities cost of $1,200/ac and an operations and maintenance cost of 30%.

Table 5.25 shows the breakdown of cost. Facilities costs shown are associated with the full demand reduction volume listed.

Table 5.25: Cost Estimate for Drip Irrigation

WUG	County	Basin	Total Facilities Cost	Total Project Costs	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Mills	Brazos	$618,000	$857,000	$245,000	$534
Irrigation	Gillespie	Colorado	$46,000	$64,000	$18,000	$643
Irrigation	San Saba	Colorado	$601,000	$834,000	$239,000	$382

5.2.3 Major Water Provider Management Strategies

There are three Major Water Providers, as defined by the State planning process in Region K: LCRA, Austin, and West Travis County Public Utility Agency (WTCPUA). Austin and WTCPUA are also water customers of LCRA, and together they supply a large portion of Region K's water needs for multiple beneficial purposes.

5.2.3.1 LCRA Water Management Strategies

LCRA holds surface water rights to over 2.1 million ac-ft of water in the Colorado River Basin, and holds groundwater permits for industrial use, as well as rights to develop groundwater in Bastrop County. Combined, LCRA's surface water rights authorize every legal purpose of use and help meet certain environmental flow needs. The LCRA is directed by the Texas Legislature to be the steward of its water rights in serving as the regional water supplier. The LCRA supplies water for municipal, agricultural, manufacturing, steam electric, mining, and other water uses. The LCRA currently has contracts to supply water to entities in Bastrop, Burnet, Colorado, Fayette, Gillespie, Hays, Lampasas (Region G), Llano, Mason, Matagorda, San Saba, Travis, Wharton, and Williamson (including the portion of Williamson in Region G) counties.

LCRA has no existing firm municipal and industrial water needs, as identified in *Table 4.15* of *Chapter 4*. With additional new contracts and contract amendments that are recommended in this plan, the firm water needs for LCRA begin in the 2020 decade, without accounting for new strategies including return flows. In addition, the new critical drought period and reduced water availability required LCRA to look at a variety of water supply options. LCRA's strategy for meeting the region's changing and future water needs will be predicated on LCRA's ability to continue to use all its water rights as a system. This includes not only the amendment of its water rights to meet changing and future water needs, but also an aggressive water conservation efforts program and the development of new water supplies. *Table 5.26* below provides a summary of all the recommended strategies related to the LCRA as a wholesale water provider. The sections following the table discuss the strategies in more detail.

Table 5.26: Summary of LCRA Water Management Strategies (ac-ft/yr)

Recommended Strategy	2020	2030	2040	2050	2060	2070
Downstream Return Flows	3,985	4,969	6,072	7,164	8,267	8,267
Enhanced Municipal and Industrial Conservation	5,100	9,700	15,000	20,000	20,000	20,000
Amendment of ROR Water Rights, including Garwood	N/A	N/A	N/A	N/A	N/A	N/A
Acquire New Water Rights	0	250	250	250	250	250
LCRA Contract Amendments	(12,600)	(5,700)	(6,100)	(9,800)	(13,150)	(13,320)
LCRA Contract Amendments with Infrastructure	0	(7,400)	(8,400)	(10,600)	(10,600)	(11,500)
New LCRA Contracts	0	0	(6,320)	(6,520)	(6,720)	(6,720)
New LCRA Contracts with Infrastructure	0	(3,200)	(7,900)	(12,400)	(20,400)	(31,600)
Expand Use of Groundwater - Carrizo-Wilcox Aquifer	0	30	30	30	30	30
Import Return Flows from Williamson County	0	5,460	10,920	16,380	21,840	25,000
Baylor Creek Reservoir	0	0	18,000	18,000	18,000	18,000
Aquifer Storage and Recovery	0	0	12,973	12,973	12,973	12,973
Enhanced Recharge	0	0	14,486	14,486	14,486	14,486
Mid-Basin Off-Channel Reservoir	0	20,000	20,000	20,000	20,000	20,000
Prairie Site Off-Channel Reservoir	0	19,500	9,500	0	0	0
Excess Flows Permit (5731) Off-Channel Reservoir	39,247	39,247	39,247	39,247	39,247	39,247
Total	**35,732**	**82,856**	**117,758**	**109,210**	**104,223**	**95,113**

5.2.3.1.1. General LCRA Strategy - LCRA System Operation Approach

To meet existing water needs in the basin, LCRA has traditionally used its larger water rights together as a system, including its water rights for lakes Buchanan and Travis as well as its downstream run-of-river (ROR) rights. To date, LCRA has largely done this through its Water Management Plan (discussed below) and thus, its efforts have been focused on the management of lakes Buchanan and Travis to meet projected firm municipal and industrial customer demands while continuing to provide interruptible supplies to downstream agricultural operations and provide both firm and interruptible supplies to help meet certain environmental flow needs.[3] More recently, LCRA has increased use of its ROR rights and groundwater rights to meet downstream needs that would otherwise have been met from stored water released from lakes

[3] For a general description of the LCRA Water Management Plan (WMP), see *Section 3.2.1.1.2.1*.

Buchanan and Travis. Indeed, most of LCRA's firm contracts provide operational flexibility to LCRA by recognizing that LCRA can meet its commitments from any source available to LCRA. As water needs increase and change over time, LCRA will continue to employ a system approach that considers *all* its water supplies and the most efficient way to meet water needs within LCRA's service area. LCRA may pursue amendments to its existing water rights, acquire or develop new water supplies, and implement aggressive water conservation measures and water use efficiencies, all to provide LCRA with the flexibility it needs to help meet future water demands within its service area.

Issues and Considerations

The use of a system approach allows LCRA greater flexibility to help meet water needs throughout its service area from a variety of water supply sources. The system approach may involve a number of specific strategies, including amendments to its existing water rights, acquisition or development of new water supplies, and implementation of aggressive water conservation measures and water use efficiencies, which are examined in greater detail in succeeding sections, with an analysis of the environmental consequences of each.

5.2.3.1.2. Amendments to Water Management Plan

LCRA's current Water Management Plan was approved in November 2015 (2015 WMP). LCRA has pending an application to amend the 2015 WMP to adjust the conditions under which it will provide water from lakes Buchanan and Travis for interruptible agricultural purposes and environmental flows to ensure that it can satisfy the demands of its firm customers, considering a year 2025 level of demand and 2020 demands for downstream agricultural operations. To ensure that LCRA can meet projected firm customer demands over the fifty-year planning horizon covered by this plan, and as LCRA implements other water supply strategies that affect how it operates its system of water supplies, LCRA will likely seek further amendments to its Water Management Plan to adjust the conditions under which it will provide water from lakes Buchanan and Travis to help meet demands for firm, interruptible agricultural, and environmental flows purposes.

Environmental Flow Assumptions for WMP Revisions

For the simulation of 2020 and 2070 conditions, the modeling incorporates all the key environmental flow elements of the 2015 WMP, including three levels of instream flow criteria with the subsistence criteria engaged at all times, and five levels of bay inflow criteria, with the threshold criteria engaged at all time. The modeling also includes the maximum environmental flow caps implemented as stipulated in the 2015 WMP. Environmental flow criteria are determined on two dates during the year based on several conditions in the basin. The RWPG used the 2015 WMP because this is the WMP in effect. LCRA filed a proposed new WMP in early 2019 that is still under review by TCEQ.

Issues and Considerations

The 2015 WMP commits 33,440 ac-ft of firm water for instream and bay and estuary inflows. In addition, interruptible water is also supplied to help meet environmental flow needs under the 2015 WMP. Firm and interruptible water provided by LCRA will provide some additional benefit to instream flows and bay and estuary inflows. However, the main issue of growth in municipal, manufacturing and steam-electric demand has a potential to reduce the amount of interruptible supply LCRA can make available for environmental flow needs in the future. To the extent that LCRA is able to provide interruptible water to the lower counties for agricultural use could also benefit environmental flows. Interruptible water traveling downstream to the point of diversion also helps meet instream flow needs. In addition, some agricultural return flows make their way to the Colorado River and Matagorda Bay system.

Available Interruptible Water Supply for Agriculture

The LCRA supplies interruptible water to four major agricultural operations within the three lower counties. Three operations are owned and operated by LCRA—the Garwood, Gulf Coast and Lakeside agricultural divisions. The forth operation is Pierce Ranch which is privately owned and operated. Historically, LCRA has supplied water to these four agricultural operations using its four ROR water rights to the extent that flows in the river are available. However, often in the height of the irrigation season, ROR flows available in the Colorado River are insufficient to meet the needs of the four operations. LCRA may make stored water from lakes Buchanan and Travis available on an interruptible basis at any time that the actual demand for stored water under firm commitments is less than the combined firm yield of lakes Buchanan and Travis. The conditions under which LCRA can provide interruptible stored water are set forth in detail in the LCRA's Water Management Plan, as amended from time to time. Consistent with these conditions, LCRA has provided interruptible stored water from lakes Buchanan and Travis to meet the demands of these four operations. In 2012-2015, TCEQ issued emergency orders amending the prior version of the WMP that resulted in the suspension of releases of interruptible stored water for downstream agricultural use in Gulf Coast, Lakeside and Pierce Ranch. The 2015 WMP includes a three-tier regime for interruptible agricultural customers that considers lake storage and inflow conditions. The structure includes three curtailment conditions: extraordinary drought, less severe drought and normal conditions, for decisions on whether and how much stored water from the Highland lakes would be available for interruptible agricultural customers. It allocates water to the Gulf Coast, Lakeside and Pierce Ranch operations separately for first season (March 1 conditions) and second season (July 1 conditions), and it includes a look-ahead test that prevents release of interruptible stored water if the LCRA Board of Directors determines that lake storage will drop below set levels in the upcoming crop season or the next 12 months.

LCRA's firm customers' demands are well below their full contract commitments and LCRA does not expect firm customers' demands to increase to their full commitments for some time. Therefore, LCRA expects that, absent extraordinary drought conditions such as those that were experienced between 2011 and 2015, it will be able to supply interruptible water to the agricultural operations in many years without frequent or significant curtailment. However, over time, as the LCRA's current firm customers draw fully on their commitments and as LCRA contracts to provide more firm water, there will be less interruptible water available for agricultural purposes in the lower basin and the conditions of curtailment and allocation of available interruptible supply among the agricultural operations will be modified.[4]

As discussed above, *Table 5.27* presents an analysis of the amount of interruptible water expected to be available during each decade of the planning period using a modified version of the Region K Cutoff Model (Strategy) based on incorporating regional water planning demand projections for LCRA's existing firm customers, updated estimates for future agricultural water needs in LCRA's lower basin agricultural operations, and assumed levels of passive water conservation discussed elsewhere in this plan. The amount of interruptible water available for agricultural use is estimated to decrease from approximately 63,495 ac-ft/yr in 2020 to 0 ac-ft/yr in 2050 due to increased firm demands in the basin. Interruptible water availability

[4] When LCRA purchased both the Garwood Irrigation Company and Pierce Ranch water rights, it made certain commitments to provide interruptible stored water based upon specific requirements in the purchase agreements. This affects the manner in which LCRA allocates available interruptible water supply among the four irrigation operations.

reported in this table is for the Gulf Coast, Lakeside and Pierce Ranch water rights. Irrigation water available to the Garwood water right is reported in *Chapter 3* of the 2021 Region K Water Plan.

Table 5.27: Available Interruptible LCRA Water Supply for Agricultural Use

Decade	Available [1] Interruptible Water Supply (ac-ft/yr)
2020	63,495
2030 [2]	25,797
2040	13,105
2050 [2]	0
2060 [2]	0
2070	0

[1] Annual supply of interruptible stored water available averaged over the drought of record.
[2] Simulations were conducted for only 2020, 2040, and 2070. Information for other decades was interpolated from the results from those decades.

As the table indicates, the availability of interruptible water supply is expected to decrease significantly in the future as the demands for firm water increase. It should be noted that these values differ from the results of analysis completed by LCRA in support of its Water Management Plan because the Region K Cutoff Model includes different assumptions per the planning guidelines.

Cost Implications of Proposed Strategy

Capital expenditures for water supply purposes would not be required to implement this alternative since diversions would be made under existing water rights. Where allowed, the cost of raw water is included in the overall cost of service to deliver the water within each agricultural operation under this alternative. Rates between LCRA's agricultural divisions vary based on several factors, including canal operation costs and contractual restrictions. The 2019 cost rate for the Gulf Coast and Lakeside divisions is $60/ac-ft of water delivered from the canal system. The 2019 Garwood cost rates range from $37 to $44/ac-ft, depending on the customer's location in the canal system.

Issues and Considerations

The 2015 WMP includes a three-tier regime for interruptible agricultural customers that considers lake storage and inflow conditions. Additional details are provided on the previous page of this document. How this may be handled in future amendments to the WMP during the planning period cannot be known at this time; however, it is clear that actual availability of this supply from year to year, or by season, can vary greatly, largely as a function of drought conditions, lake levels, inflows into the lakes, and demands for firm water.

Environmental Considerations

As noted above, the increasing municipal, manufacturing and steam-electric demands will reduce the amount of interruptible water that is available over time for the downstream agricultural operations. This could indirectly reduce the water available in the lower basin to help meet instream and bay and estuary inflows needs. In the earlier planning decades, this strategy can provide additional streamflow of up to approximately 63,495 ac-ft/yr, as shown in *Table 5.27*.

Agricultural & Natural Resources Considerations

Interruptible water, when it's available, has a positive impact on agriculture. The impact decreases over time as the availability decreases over time. In the earlier planning decades, this strategy can provide additional water for agriculture of up to approximately 63,495 ac-ft/yr, as shown in *Table 5.27*.

5.2.3.1.3. Amendments to Water Rights and Acquisition of New Water Rights

LCRA owns three downstream run-of-river (ROR) water rights which authorize a total diversion of up to 503,750 ac-ft/yr on the lower Colorado River (14-5475, 14-5476, 14-5477).

Today, LCRA uses these water rights primarily as part of its interruptible water supply provided for irrigated agriculture within Colorado, Wharton, and Matagorda Counties. However, these water rights are already authorized for multiple beneficial purposes and, in some cases, authorized for use in other locations. By further amending these water rights to add additional diversion points and authorization to store the water in existing or new reservoirs, LCRA could use these water rights to meet firm demands in conjunction with its other water supplies. LCRA already received an amendment to add new diversions points to another of its ROR rights, Certificate of Adjudication No. 14-5434, and can use that right today to meet upstream firm demands. Further, LCRA uses ROR water under Certificate of Adjudication No. 14-5476 to supply industrial demands along its canal system and is authorized to store water available under this right in its new Arbuckle reservoir. Similar amendments could be pursued for the other ROR rights. This water management strategy recognizes that LCRA intends to amend any and all its ROR water rights to meet future and changing water needs.

In addition to amending existing water rights, from time to time, LCRA may purchase water rights that have the potential to enhance LCRA's overall water supply portfolio. Acquisition of water rights by LCRA could occur in any of LCRA's water service area counties, and these counties include all the counties in the Region K regional planning area. For purposes of describing a water management strategy, the acquisition could be for a water right authorizing run-of-river diversions up to 500 ac-ft/yr. However, the quantity could also vary considerably from the amount assumed, dependent on the actual amount and location of water rights available for purchase, which cannot be predicted with any certainty at this time. Further, for planning purposes, the water right is assumed to have a reliable supply of about one-half of its diversion right, or about 250 ac-ft/year of reliable water acquired for each water right. Amendments similar to those discussed above for LCRA's existing ROR rights may be needed. This strategy is expected to come online by 2030.

Cost Implications of Proposed Strategy

Capital expenditures for water supply purposes would not be required to implement the amendment portion of this strategy to the extent that the diversions of these rights for other purposes will be done at locations already authorized for diversion under other water rights held by LCRA using existing infrastructure, stored in existing reservoirs, or diverted by customers with existing infrastructure. The annual cost of providing raw water under this alternative is the September 2018 LCRA system rate for water diverted, which is $145/ac-ft.

The acquisition cost used for the analysis is $500/ac-ft of reliable water, though cost could vary greatly depending on the specific characteristics of any water right acquired (one-time cost, which can be considered a capital investment). This will be a capital cost of $125,000.

Issues and Considerations

Conversion of agricultural rights to serve municipal, manufacturing, and steam-electric needs may not have a significant impact on downstream instream and bay and estuary freshwater inflows. TCEQ may include special conditions to limit diversions based on environmental flow needs, and some of the water supplied from these rights may be to downstream customers. Further, water from other sources may be provided to meet the downstream agricultural needs or to help meet environmental flow needs. In addition, use of ROR water for municipal needs upstream could result in a greater volume of return flows, which if returned to the river in Austin and surrounding area locations, would help off-set any reduction in downstream ROR flows and help provide for instream flow needs. In addition, municipal return flows are more constant than the flows required for agricultural use. Municipal return flows are expected to be discharged year-round whereas downstream agricultural demands are significantly reduced during the winter months.

Issues and considerations for the amendment of a surface water right is site-specific and depends on several factors, including impacts to existing water rights and environmental flows compared to full use of the water right as authorized for use at its existing location. The terms and conditions of any potential water right acquisition will be very case-specific and will be affected by a number of factors, such as the timing of the need for the water, priority date, etc.

Environmental Considerations

Impacts related to the amendment of the Gulf Coast and Lakeside water rights can be considered negligible because they are already quantified and accounted for under the off-channel reservoir strategies, as discussed in *Section 5.2.3.1.10*. It is anticipated that amendments to the Pierce Ranch water right would have negligible impacts during times of drought, due to the limited available water. The water right has an authorized diversion of 55,000 ac-ft/yr with a priority date of 9/01/1907. Depending on the location of the new diversion, the diversion amount, and special conditions contained in the amendment, instream flows could be reduced. Impacts will be evaluated during the TCEQ permitting process and the amended water right will be subject to instream flow requirements.

For acquisition of water rights, there is a potential positive benefit of up to 250 ac-ft/yr to environmental flows during drought conditions for the situation where upstream water rights are acquired and the diversion point is moved downstream, thereby leaving water in a portion of the river that otherwise would have been diverted upstream. For the situation where a water right is moved upstream, the TCEQ typically will impose permit conditions to protect intervening water right holders and address instream environmental impacts.

Agricultural & Natural Resources Considerations

Amendments to LCRA's ROR rights could reduce availability of that water for agricultural purposes. Impacts related to the amendment of the Gulf Coast and Lakeside water rights can be considered negligible because they are already quantified and accounted for under the off-channel reservoir strategies, as discussed in later sections. It is anticipated that amendments to the Pierce Ranch water right would have negligible impacts during times of drought, due to the limited available water even as currently authorized. The water right has an authorized diversion of 55,000 ac-ft/yr. However, LCRA has a contractual obligation to deliver up to 30,000 ac-ft/yr to Pierce Ranch. Run-of-river water deliveries to irrigation above 30,000 ac-ft/yr are not from this water right and no impact would occur to agriculture by the transfer of a portion of this water right.

5.2.3.1.4. LCRA Contract Amendments

LCRA has contracts or Board reservations for raw water supply with numerous water user groups (WUGs). LCRA has indicated that it expects to continue providing water to these entities throughout the 50-year planning period and expects to meet these customers' projected increased demands for water through amendments to existing contracts to increase contract quantities. For the purposes of this plan, water supplied to these customers largely comes from lakes Buchanan and Travis. However, as discussed in more detail elsewhere in this chapter, LCRA operates its water rights as a system. To the extent that these customers have obtained contracts or amendments to contracts since 1999, their current LCRA contract provides that water may be supplied under the contract from any source available to LCRA at the time the customer uses water. Water sources include supply from lakes Buchanan and Travis, LCRA's ROR rights, groundwater, or other sources that might come under LCRA's control. To the extent that existing customers' contracts do not contain this language, and such customers need to renew their contracts or increase the contract quantity, the new contracts will include similar language regarding source of supply.

Capital expenditures for water supply purposes were not assumed to be required to implement this alternative. The average cost of providing raw water under this alternative is $145/ac-ft in September 2018 dollars. *Table 5.28* contains a summary of the WUGs for which this strategy is applied, and the amount of water planned for in the contract amendment (where increased amounts of water are needed).

Table 5.28: LCRA Contract Amendments Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Granite Shoals	Burnet	Colorado	0	0	0	0	50	170
Horseshoe Bay	Burnet	Colorado	0	0	400	600	800	800
Steam-Electric (COA)	Fayette	Colorado	4,300	4,300	4,300	4,300	4,300	4,300
Dripping Springs WSC*	Hays	Colorado	0	0	0	1,000	2,000	2,000
Steam-Electric (STPNOC)	Matagorda	Colorado	8,300	0	0	0	0	0
Leander	Travis	Colorado	0	1,400	1,400	2,600	2,600	2,600
Pflugerville	Travis	Colorado	0	0	0	1,300	3,400	3,400
Travis County WCID Point Venture	Travis	Colorado	0	0	0	0	0	50
Total			**12,600**	**5,700**	**6,100**	**9,800**	**13,150**	**13,320**

* The West Travis County PUA Contract Amendment with Infrastructure Strategy in Section 5.2.3.1.5 includes infrastructure sized to accommodate this contract amendment amount, as Dripping Springs WSC is a treat-and-transport customer of West Tavis County PUA.

Cost Implications of Proposed Strategy

Capital expenditures for water supply purposes were not assumed to be required to implement this alternative. The average cost of providing raw water under this strategy is currently (September 2018) $145/ac-ft.

Issues and Considerations

Amendment of existing contracts to meet increasing municipal, manufacturing, and steam-electric demands will provide for the needs of a growing population but could reduce the amount of interruptible water available for agricultural use and environmental flows depending on what other strategies are implemented by LCRA to further enhance and optimize operation of its system of water supplies. Similarly, as firm water customers use more and more of their contracted water, the available interruptible supply could be reduced.

Environmental Considerations

Depending on the location of the contracted water, some environmental impacts to instream flows and freshwater inflows to Matagorda Bay can be expected from increased use of water under LCRA contracts, including amendments to existing contracts and new water sale contracts. Increased firm demands for municipal and industrial uses will reduce the amount of interruptible water available for release. Interruptible water provides a benefit to instream flows as it travels downstream to the diversion points. Increased contract volumes for users at the downstream end of the basin would also increase instream flows. Individual WUG implementation of this strategy has negligible impacts to streamflows and the bay, but full regional implementation could remove up to 13,320 ac-ft/yr from the Highland Lakes or other LCRA sources by 2070.

Agricultural & Natural Resources Considerations

The increasing municipal and industrial needs for water will have a significant impact on agriculture as the available supply of interruptible water gradually diminishes over time. The extent of these impacts to interruptible water availability will be affected by the rate at which firm demands actually materialize and could also be affected by the timing and implementation of other strategies by LCRA to further enhance and optimize operation of its system of water supplies.

5.2.3.1.5. LCRA Contract Amendments with Infrastructure

LCRA has contracts or Board reservations for raw water supply with numerous water user groups (WUGs). LCRA has indicated that it expects to continue providing water to these entities throughout the 50-year planning period and expects to meet these customers' projected increased demands for water through amendments to existing contracts to increase contract quantities. For the purposes of this plan, water supplied to these customers may come from the Highland Lakes or the Colorado River. However, as discussed in more detail elsewhere in *Chapter 5* of the 2021 Plan, LCRA operates its water rights as a system. To the extent that these customers have obtained contracts or amendments to contracts since 1999, their current LCRA contract provides that water may be supplied under the contract from any source available to LCRA at the time the customer uses water. Water sources include supply from lakes Buchanan and Travis, LCRA's ROR rights, groundwater, or other sources that might come under LCRA's control. To the extent that existing customers' contracts do not contain this language, and such customers need to renew their contracts or increase the contract quantity, the new contracts will include similar language regarding source of supply.

For this strategy, capital expenditures for infrastructure are required to provide the contract amendment amount. Some amendments are associated with regional projects, and the costs associated with these projects are included in separate sections.

Table 5.29 contains a summary of the WUGs for which this strategy is applied, and the amount of water planned for in the contract amendment (where increased amounts of water are needed).

Table 5.29: LCRA Contract Amendments with Infrastructure Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Burnet	Burnet	Colorado	0	1,000	2,000	2,000	2,000	2,000
Marble Falls	Burnet	Colorado	0	4,000	4,000	4,000	4,000	4,000
West Travis County PUA	Hays, Travis	Colorado	0	2,400	2,400	4,600	4,600	5,500
Total			**0**	**7,400**	**8,400**	**10,600**	**10,600**	**11,500**

Cost Implications of Proposed Strategy

The infrastructure required for each WUG is detailed below.

- Burnet and Marble Falls
  - The infrastructure associated with the contract amendments for these WUGs are described and costed in the various Burnet County Regional Projects strategies. For Burnet, costs are included in the Buena Vista Regional Project Strategy (*Section 5.2.4.5.1*); for Marble Falls, costs are included in the Marble Falls Regional Water System Strategy (*Section 5.2.4.5.3*)
- West Travis County PUA (WTCPUA)
  - Two (2) 844 HP intake pump stations, for a total of 6.7 MGD transmitted flow, located adjacent to current pump station on the Colorado River at Bohls Hollow
  - 2-mile, 30-inch raw water transmission main to existing WTCPUA-owned water treatment plant

Costing assumptions for the West Travis County PUA (WTCPUA) strategy are detailed as follows. The infrastructure for West Travis County PUA in this strategy was sized to provide treatment for both the WTCPUA contract amendment amount (5,500 ac-ft/yr) and the amendment amount for WTCPUA's treat and transport customers listed in the LCRA Contract Amendments Strategy (2,000 ac-ft/yr). The Texas Water Development Board Cost Estimating Tool was used to size and cost infrastructure, with a peaking factor of 2 assumed. Consistent with the tool, all costs are given in September 2018 dollars. Land acquisition costs (for the raw water pump station and transmission main) and an annual $145/ac-ft water purchase cost is also assumed.

Costs for this strategy are detailed in the table below. The largest portion of the costs is the intake pump stations. Costs associated with the Burnet and Marble Falls amendments are included in *Sections 5.2.4.5.1* and *5.2.4.5.3*, respectively.

Table 5.30: LCRA Contract Amendments with Infrastructure Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
West Travis County PUA	Hays, Travis	Colorado	$25,499,000	$35,402,000	$4,300,000	$782

Issues and Considerations

Amendment of existing contracts to meet increasing municipal, manufacturing, and steam-electric demands will provide for the needs of a growing population but could reduce the amount of interruptible water available for agricultural use and environmental flows as demands actually materialize and depending on what other strategies are implemented by LCRA to further enhance and optimize operation of its system of water supplies. Similarly, as firm water customers use more and more of their contracted water, the available interruptible supply could be reduced.

Environmental Considerations

Depending on the location of the contracted water, some environmental impacts to instream flows and freshwater inflows to Matagorda Bay can be expected from increased use of water under LCRA contracts, including amendments to existing contracts and new water sale contracts. Increased firm demands for municipal and industrial uses will reduce the amount of interruptible water available for release. Interruptible water provides a benefit to instream flows as it travels downstream to the diversion points. Individual WUG implementation of this strategy has negligible impacts to streamflows and the bay, but full regional implementation could remove up to 11,500 ac-ft/yr from the Highland Lakes or other proposed LCRA sources by 2070.

Agricultural & Natural Resources Considerations

In general, the increasing municipal and manufacturing needs for water will have a significant impact on agriculture as the available supply of interruptible water gradually diminishes over time. The extent of these impacts to interruptible water availability will be affected by the rate at which firm demands materialize and could also be affected by the timing and implementation of other strategies by LCRA to further enhance and optimize operation of its system of water supplies.

5.2.3.1.6. New LCRA Contracts

Region K has identified shortages within LCRA's service area that are not currently covered by a water sale contract from LCRA but for which LCRA may be willing and able to provide raw water. In particular, many of these include rural communities in the upper portion of the LCRWPA and certain current wholesale customers of Austin whose contract is expected to expire during the planning period. Certain wholesale customers currently receiving water from Austin may need to obtain raw water contracts directly from LCRA in the future. Austin plans to continue to treat and transport this water. This raw water contracting approach generally does not apply to Austin wholesale customers that are Municipal Utility Districts (MUDs), since Austin generally plans to annex these areas in the future, consistent with the MUD's creation agreements with Austin.

As new customers, contracts for water supplied to these customers will come from any source available to LCRA at the time the customer uses water. *Table 5.31* summarizes recommended new LCRA contracts over the planning horizon.

Table 5.31: New LCRA Contracts Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
North Austin MUD 1*	Travis, Williamson	Colorado, Brazos	0	0	770	770	770	770
Northtown MUD*	Travis	Colorado	0	0	900	1,100	1,300	1,300
Rollingwood*	Travis	Colorado	0	0	250	250	250	250
Sunset Valley	Travis	Colorado	0	0	300	300	300	300
Travis County WCID 10*	Travis	Colorado	0	0	2,300	2,300	2,300	2,300
Wells Branch MUD*	Travis, Williamson	Colorado, Brazos	0	0	1,400	1,400	1,400	1,400
Windermere Utility*	Travis	Colorado	0	0	400	400	400	400
Total			**0**	**0**	**6,320**	**6,520**	**6,720**	**6,720**

*Current wholesale customers of Austin

Cost Implications of Proposed Strategy

Capital expenditures for water supply purposes were not assumed to be required to implement this strategy. The average cost of providing raw water under this strategy is $145/ac-ft in September 2018 dollars.

Issues and Considerations

Much of the water that would be dedicated to new LCRA contracts in Travis County is already being supplied through Austin Water. Based on Austin’s raw water contracting plans in this manner, the only change will be that LCRA will contract directly with those certain wholesale customers for raw water instead of Austin Water and Austin Water will continue to treat and transport the water to these entities.

Environmental Considerations

Individual WUG implementation of this strategy has negligible impacts to streamflows and the bay, but full regional implementation could remove up to 6,320 ac-ft/yr from the Highland Lakes or other LCRA sources by 2070.

Agricultural & Natural Resources Considerations

Any large new contracts that would need to use supplies from lakes Buchanan and Travis or other LCRA firm water supplies may decrease over time the amount of interruptible water available for agriculture. The extent of these impacts to interruptible water availability will be affected by the rate at which firm demands actually materialize and could also be affected by the timing and implementation of other strategies by LCRA to further enhance and optimize operation of its system of water supplies.

5.2.3.1.7. New LCRA Contracts with Infrastructure

Region K has identified shortages within LCRA's service area that are not currently covered by a water sale contract from LCRA but for which LCRA may be willing and able to provide raw water. To supply this water, new infrastructure will be needed in order to obtain and treat the water. As new customers, contracts for water supplied to these customers may come from any source available to LCRA at the time the customer uses water. However, for the purposes of costing, all identified WUGs are assumed to receive water from surface water intakes along the Colorado River.

Due to a lack of groundwater availability for regional planning purposes under the MAG for the Carrizo-Wilcox Aquifer in Bastrop County, the LCRWPG looked at surface water as a source to meet water needs in future decades. Aqua WSC, Bastrop, and Bastrop County WCID 2 are assumed to receive water from the Bastrop Regional Project, which will deliver water from a single intake and water treatment plant to transmission mains to each WUG's distribution system. For Burnet County-Other, the infrastructure needed is associated with a regional project and the costs associated are included in a separate section.

Table 5.32 summarizes recommended new LCRA contract yields over the planning horizon.

Table 5.32: New LCRA Contracts with Infrastructure Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Aqua WSC	Bastrop	Colorado	0	0	2,500	6,000	12,000	20,000
Bastrop	Bastrop	Colorado	0	0	0	1,000	2,500	4,000
Bastrop County WCID 2	Bastrop	Colorado	0	0	0	0	500	1,500
Bastrop Regional Project Total			**0**	**0**	**2,500**	**7,000**	**15,000**	**25,500**
Smithville	Bastrop	Colorado	0	0	0	0	0	700
County-Other	Burnet	Brazos, Colorado	0	3,200	5,400	5,400	5,400	5,400
Total			**0**	**3,200**	**7,900**	**12,400**	**20,400**	**31,600**

Cost Implications of Proposed Strategy

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. In addition to the infrastructure listed below, an additional $145/ac-ft of water purchase from LCRA was assumed. The Bastrop Regional Project costs have been split proportionally among Aqua WSC, Bastrop, and Bastrop County WCID 2 based on yield.

The infrastructure required for each WUG is detailed below.

- Bastrop County Regional Project
  - WUGs serviced: Aqua WSC, Bastrop, and Bastrop County WCID 2
  - 805 HP raw water intake pump station on the Colorado River near Bastrop
  - 0.5-mi, 42-in raw water transmission main to water treatment plant

  - 24 MGD surface water treatment plant
  - 5-mi, 36-in treated water transmission main to Aqua WSC
  - 3-mi, 18-in treated water transmission main to Bastrop
  - 2-mi, 10-in treated water transmission main to Bastrop County WCID 2

- Smithville
  - 23 HP raw water intake pump station on Colorado River
  - 0.5-mi, 8-in raw water transmission main
  - 0.6 MGD surface water treatment plant

- Burnet County-Other
  - The infrastructures associated with this new water sale contract are described and costed in various Burnet County Regional Projects strategies, including the Buena Vista Regional Project Strategy (*Section 5.2.4.5.1*), the East Lake Buchanan Strategy (*Section 5.2.4.5.2*), and the Marble Falls Regional Water System Strategy (*Section 5.2.4.5.3*).

Table 5.33: New LCRA Contracts with Infrastructure Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC	Bastrop	Colorado	$95,048,000	$132,037,000	$18,286,000	$914
Bastrop	Bastrop	Colorado	$19,010,000	$26,407,000	$3,657,000	$914
Bastrop County WCID 2	Bastrop	Colorado	$7,129,000	$9,903,000	$1,372,000	$914
Smithville	Bastrop	Colorado	$7,573,000	$10,589,000	$1,373,000	$1,961

Environmental Considerations

Individual WUG implementation of this strategy has negligible impacts to instream flows and flows to the bay, but full regional implementation could remove up to 31,600 ac-ft/yr from the Highland Lakes or other LCRA sources by 2070.

Agricultural & Natural Resources Considerations

Any large new contracts that would require releases from lakes Buchanan and Travis or other LCRA firm water supplies may decrease over time the amount of interruptible water available for agriculture. The extent of these impacts to interruptible water availability will be affected by the rate at which firm demands materialize and could also be affected by the timing and implementation of other strategies by LCRA to further enhance and optimize operation of its system of water supplies.

5.2.3.1.8. Conservation

TWDB requires that all conservation strategies be located within a single Conservation section in the 2021 Region K Water Plan. LCRA conservation strategies are covered in *Section 5.2.2.1*, LCRA Conservation.

5.2.3.1.9. Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)

LCRA plans to continue expanding its use of groundwater sources to meet future demands. LCRA currently holds groundwater permits from the Lost Pines Groundwater Conservation District for production wells in the Carrizo-Wilcox Aquifer in Bastrop County and has filed applications for permits to develop up to 25,000 ac-ft/yr of additional groundwater in Bastrop County for municipal, industrial, and other beneficial uses.

A preliminary analysis from LCRA indicated that a well field would be located on the Griffith League Ranch in central Bastrop County and used LCRA customer demands. The groundwater is anticipated for use in Bastrop County, but could also potentially be used in Travis and Lee Counties within the LCRA service area.

The yield for this strategy was determined by subtracting the water that is currently allocated from the available water under the Modeled Available Groundwater (MAG). However, because the TWDB rules require the planning group to treat the MAG as a cap in the planning process, there is only a small quantity of groundwater available; therefore, the delivery of water under this strategy is limited to the local area around the well field. The Carrizo-Wilcox Aquifer in Bastrop County had little remaining water under the MAG for strategies after regional water planning supplies were allocated, so strategy volumes are limited. *Table 5.34* shows the implementation decade and the amount of water to be pumped for all planning decades.

Table 5.34: LCRA Expand Use of Groundwater (Carrizo-Wilcox) Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	30	30	30	30	30

Since the MAG is not a cap on groundwater permitting, there is additional demand that could be served if the Lost Pines Groundwater Conservation District issues a permit to LCRA for a larger yield. However, because a larger amount would exceed the MAG cap that is imposed by the TWDB planning rules, such a strategy is included as an alternative strategy.

The following infrastructure would be required for this strategy:

- One (1) 18 gpm Water Supply Well
- Approximately 1000 feet of raw water transmission piping and appurtenances

A peaking factor of one (1) was assumed. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. The well was assumed to have an efficiency of 80%.

Cost Implications of Proposed Strategy

In order to provide a comparable cost consistent with other strategies in this report, costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars. The Cost Estimating Tool was also used to determine operating costs.

The capital cost for this strategy is primarily driven by the cost of the well field and transmission pipeline. Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool. The following table shows the estimated costs associated with this strategy.

Table 5.35: LCRA Expand Use of Groundwater (Carrizo-Wilcox) Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$174,000	$331,000	$25,000	$833

Environmental Considerations

This strategy's yield is so small it will have negligible impacts. No unreasonable impacts to surface water resources are anticipated.

The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to the overall drawdown in the aquifer of up to 240 feet, relative to January 2000 conditions.

The project is subject to requirements of the LCRA's Incidental Take Permit and Habitat Conservation Plan and associated requirements of the U.S. Fish and Wildlife Service. In addition, there are several endangered or threatened species that may need to be taken into consideration during design. *Appendix 1A* in *Chapter 1* provides a list of rare, threatened, and endangered species by county. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.3.1.10. Import Return Flows from Williamson County

LCRA has been evaluating water management strategies to develop water supplies by importing return flows (i.e. treated wastewater effluent) from entities in Williamson County that have contracts with LCRA for firm water from the Colorado River and for which exempt interbasin transfer permits have been issued allowing the water to be used in the Brazos River basin within Williamson County.

A recent engineering study evaluated various options for returning water back to the Colorado River basin. The most likely source of return flows is the Brushy Creek Regional Wastewater Treatment Plant (BCRWWTP) which currently discharges into Brushy Creek which is in the Brazos River Basin. Return flows could also be secured from the Leander wastewater treatment plant, which also discharges further upstream into Brushy Creek, in the Brazos River basin.

Two options have been considered: 1) return flows could be pumped directly from the BCRWWTP through a 16-mile transmission pipeline to the mid-basin reservoir proposed as an LCRA strategy in this regional plan or to other terminal storage, or 2) return flows could be discharged to Brushy Creek from the BCRWWTP and/or the Leander WWTP and a bed-and-banks permit would be used to transport the water downstream for diversion at a pump station that would pump the water through an 11-mile transmission pipeline to Wilbarger Creek which feeds into the Colorado River. The return flows can be transported by the bed-and-banks of Wilbarger Creek and the Colorado River to diversions points of LCRA's firm customers, or to one of the off-channel reservoirs. Alignments and cost estimates were prepared for LCRA by the engineering consultant. LCRA may need to obtain an interbasin transfer permit to import return flows from the Brazos River basin to the Colorado River basin. LCRA will likely also secure a bed and banks permit to retain ownership and control of the imported return flows once discharged into the Colorado River basin.

Consistent with the 2016 Regional Water Plan, Option 1 has been evaluated since it has more infrastructure requirements and a longer pipeline route. Based on these criteria, the water management strategy will consist of obtaining necessary water rights permits, construction of tertiary treatment upgrades at BCRWWTP, a pump station and a storage tank at BCRWWTP, and a water transmission pipeline. There are two Brushy Creek WWTP locations. Based on available flow data from each location, East and West, the source for this strategy is assumed to be the BCRWWTP East.

Table 5.36: LCRA Import Return Flows from Williamson County Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	5,460	10,920	16,380	21,840	25,000

Cost Implications of Proposed Strategy

The TWDB Cost Estimating Tool and information from LCRA's consultant was used to determine project costs. The facilities cost for this strategy is primarily driven by the cost of the transmission pipeline. The following table shows the estimated costs associated with this strategy. Costs are given in September 2018 dollars.

The following infrastructure was proposed:

- Pump Station and Storage Tank at BCRWWTP
- Tertiary Treatment upgrade at BCRWWTP
- Approximately sixteen (16) miles of 42-inch transmission piping and appurtenances

Table 5.37: LCRA Import Return Flows from Williamson County Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$54,241,000	$75,734,000	$6,080,000	$243

Environmental Considerations

Either option will need to ensure that water quality is not degraded as a result of discharge to a mid-basin reservoir or Wilbarger Creek. Infrastructure improvements identified at the WWTP include tertiary treatment for phosphorus removal before effluent can be discharged into a reservoir.

The discharge point shall be at a point in the reservoir or creek where it has sufficient capacity to handle the additional flow without detrimental effects to a reservoir or stream banks. The environmental impact should be low.

Depending on where the imported return flows are used, water available to help meet instream flows in the Colorado River could increase up to 25,000 ac-ft/yr as a result of the imported return flows. Return flows that are not stored and/or used to meet local or downstream demands could help meet freshwater inflow needs of Matagorda Bay.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Depending on firm demands, imported return flows could be used by LCRA to meet firm demands that would otherwise be met from stored water releases from the Highland Lakes, potentially increasing availability of interruptible water supply up to 25,000 ac-ft/yr. Imported return flows may also be used to directly increase the amount of interruptible water supply available for agricultural water users.

Interbasin Transfer Considerations

In order to bring return flows from the Brazos River Basin to the Colorado River Basin, an interbasin transfer permit (IBT) will be required, under Texas Water Code §11.085. In order to implement this strategy, LCRA would need to comply with all the provisions stated in the Code. One of the provisions requires a comparison of the water needs in the basin of origin to the water needs in the proposed receiving basin. The projected water needs (2020-2070) for the Brazos River Basin and the Colorado River Basin, as determined using data from DB22 provided by TWDB, are shown in the table below.

Table 5.38: Total Water Needs Comparison between Brazos and Colorado River Basins (ac-ft/yr)

Total Water Needs	2020	2030	2040	2050	2060	2070
Brazos River Basin	681,578	1,172,362	1,217,527	1,279,251	1,345,452	1,425,354
Colorado River Basin	238,514	402,780	441,353	469,808	513,426	571,151

Texas Water Code §11.085 also requires regional water plans to mention proposed methods and efforts by the receiving basin to avoid waste and implement water conservation. LCRA's 2019 Water Conservation Plan addresses water conservation practices for its firm water customers (municipal, industrial, power generation, and recreational). These efforts include five-year and 10-year implementation plans that will guide effective water conservation throughout communities in LCRA's rapidly growing service area and may achieve highest practicable levels of water conservation.

Details related to the conservation efforts recommended for LCRA as a major water provider are discussed in *Section 5.2.2.1*.

5.2.3.1.11. Baylor Creek Reservoir

This strategy consists of a new, 48,390 ac-ft earthen dam reservoir, located in Fayette County, adjacent to the Cedar Creek Reservoir (Lake Fayette) and the Fayette Power Project. LCRA has authorization to store water in the reservoir through their water right. On June 19, 2015, TCEQ granted LCRA a permit amendment extending the start of construction to September 18, 2035.

The purpose of this reservoir is to capture available river water not needed downstream and store the captured water for later use. The demand served by this strategy would be industrial use, in the form of cooling water requirements for the adjacent power plant. With water right amendments, the project could also provide water to downstream industrial demands and environmental uses.

The infrastructure required to implement this strategy includes:

- New 48,390 ac-ft earthen dam reservoir constructed along Baylor Creek
- A new river intake, pump station, and two 108-inch diameter, 20,600-foot long pipelines, to pump from the Colorado river to the reservoir. These pipes would also allow for return flow to the Colorado River
- Two 108-inch diameter, 100-foot long pipelines, for outlet of return flows to the Colorado River
- Two stilling basins, one in the new reservoir and one in the existing river

The maximum authorized impoundment amount for this reservoir is 48,390 ac-ft. Currently, the Baylor Creek permit only authorizes diversion and storage of water appropriated under the Highland Lakes water rights and use of that water for industrial purposes (steam-electric cooling). In order to develop a firm yield from the project, multiple permit amendments would be needed to the existing Baylor Creek permit, and perhaps to other LCRA ROR permits, in order to authorize diversion and storage of ROR flows.

An amendment to Certificate of Adjudication 14-5474A, granted April 29, 2011, states that the Owner is authorized to divert up to 73,579 ac-ft/yr of water for industrial purposes under Certificates of Adjudication 14-5478 and 14-5482, and to transport the water via pipeline to the proposed Baylor Creek Reservoir and existing Cedar Creek Reservoir. Based on information provided by LCRA, the project yield from this strategy that is available through the drought of record would be 18,000 ac-ft/yr, starting in the year 2040.

Cost Implications of Proposed Strategy

Capital costs for this strategy were developed based on information provided by LCRA and input into the Texas Water Development Board (TWDB) Cost Estimating Tool. Additionally, LCRA-provided cost estimates for environmental and archeological studies, permitting, and mitigation were input into the costing tool. Consistent with the tool, all costs are given in September 2018 dollars.

The following table shows the estimated costs associated with this strategy.

Table 5.39: LCRA Baylor Creek Reservoir Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$152,060,000	$219,883,000	$16,333,000	$907

Environmental Considerations

The Baylor Creek Reservoir would rely on capturing available river flows for its yield, thus environmental impacts as compared to a reservoir on the Colorado River should be negligible. The LCRA off-channel reservoir strategies (Prairie, Mid-Basin, and Excess Flows OCRs) allow for releases of water for improved water quantity and quality for environmental uses.

While diversions would be made under amended existing rights, this strategy would contribute to the removal of up to 73,579 ac-ft/yr from the Colorado River for storage in the proposed Baylor Creek Reservoir and existing Cedar Creek Reservoir that otherwise might not have been captured.

Refer to *Chapter 1, Appendix 1A*, for the complete list by County of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The construction of the Baylor Creek Reservoir will lessen the need to send Highland Lakes' water to industrial customers near the coast and could improve agricultural water reliability and efficiency. The new reservoir will increase LCRA's operational flexibility, which, in turn, has the potential to enhance the availability of freshwater to the region, including farmlands, managed waterfowl habitat, and coastal wetlands. This project could potentially provide up to 18,000 ac-ft/yr of water for agriculture purposes during a drought year, depending on firm customer needs.

5.2.3.1.12. Aquifer Storage and Recovery (ASR) Carrizo-Wilcox

This strategy utilizes surface water that is diverted from the Colorado River and treated at a surface water treatment facility. The treated water would either be delivered to meet existing demands or diverted to aquifer storage for later recovery and use. The annual availability was determined by obtaining the storage size of the ASR from LCRA (based on their modeling), dividing it by the number of months in the Drought of Record (111), and multiplying by 12. An annual availability during the Drought of Record was calculated to be 12,973 ac-ft/yr for this strategy, and it is assumed to come online beginning in 2040. It is assumed that the diversion point would be located in Bastrop County with the ASR wells located in an adjacent aquifer, but implementation of this strategy could occur at a more downstream diversion point as well.

The source of the water for the project is assumed to be the Colorado River through a raw water intake in Bastrop County. Water would be diverted under LCRA's existing water rights at up to 18,000 ac-ft/yr, but based on the nature of the strategy, would focus on capturing high-level flows. Raw water would be conveyed to a new water treatment plant (WTP). Components of the WTP include an inline rapid mix, backwash supply pump station, recarbonation basin, gravity thickener, clarifier, oxidant/disinfection contactor, backwash waste equalization basing, centrifuges, all chemical storage and feed systems, media filters, treated water storage, high service pump station, and operations and maintenance buildings.

To satisfy the water demand, a high service pump station would feed treated water through a 5 mile, 36-inch diameter pipeline along the SH-71 right-of-way, to a currently undetermined delivery point. The pipeline diameter was calculated to maintain flow velocities under 5 feet per second.

Treated water in excess of the demand would be sent to the ASR wellfield. A medium service pump station and ground storage tank are required at both the water treatment plant and the ASR wellfield. The dual locations are required to meet the peak day demands at all times. The ASR wellfield would include eleven (11) 12-inch diameter wells that are spaced at 0.5-mile intervals.

Cost Implications of Proposed Strategy

Costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool, based on the infrastructure identified above. Consistent with the tool, all costs are given in September 2018 dollars. The following table shows the estimated costs associated with this strategy.

Table 5.40: LCRA Aquifer Storage and Recovery Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$105,198,000	$146,592,000	$16,863,000	$1,300

Environmental Considerations

While this strategy will be diverting up to 18,000 ac-ft/yr of water from the Colorado River under existing water right(s), it is anticipated that the amended water right(s) allowing for diversion in this location would require TCEQ's SB3 environmental flow standards be met, which are considered adequate to support a sound ecological environment, to the maximum extent reasonable, considering other public interests and other relevant factors. Therefore, since diversions will be subject to the standards, this strategy is not expected to significantly adversely impact environmental flows because diversions are not likely to be possible at times that could impair water quality or other environmental flow considerations.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The implementation of this strategy would lessen the need to send Highland Lakes' water to potential customers in the Bastrop County area and could improve agricultural water reliability and efficiency. This strategy could increase LCRA's operational flexibility, which, in turn, has the potential to enhance the availability of freshwater to the region, including farmlands, managed waterfowl habitat and coastal wetlands, of up to 18,000 ac-ft/yr.

5.2.3.1.13. Enhanced Recharge

Enhanced recharge, also known as Managed Aquifer Recharge (MAR), is considered as a potential water management strategy for the LCRA for agricultural shortages in the lower Colorado River Basin. Enhanced recharge can be accomplished in a variety of ways: spreading basins, vadose zone injection wells, direct injection wells, and aquifer storage and recovery (ASR) wells. Only spreading basins are considered in this strategy.

This strategy consists of diverting water from the Colorado River, when available, and pumping to one or more recharge basins located in the recharge zone of the Gulf Coast Aquifer. The recharge basins would be designed and maintained to promote rapid entry of the water in the basins into the aquifer. The source of recharge water could be a low reliability junior water right, or it could be from one of LCRA's senior ROR water rights, particularly in the winter months when water is not otherwise being diverted. Section 11.023 of the Texas Water Code describes purposes for which water may be appropriated, and states that state water may be appropriated, stored, or diverted for recharge into an aquifer underlying this state other than an aquifer described under Subsection (c) through surface infiltration or an aquifer recharge project as defined by Section 27.201. During drought conditions, when backup surface water supplies are intermittent, the water stored underground by this project would be available to groundwater users in the area and also to wells that could augment canal flows. There may be issues with water ownership that would need to be addressed prior to implementation.

This project provides a place to store water diverted during high flows, prevents evaporative losses of the stored water, and provides a distribution system of the water through the groundwater aquifer.

The strategy would consist of:

- Providing engineered rapid infiltration basins and providing recovery wells utilizing existing diversions and canal systems.

An authorized diversion of 18,000 ac-ft/yr was used. Storage capability of 134,000 ac-ft/yr was determined by LCRA's modeling efforts. The annual availability was determined by taking the total storage, dividing it by the number of months in the Drought of Record (111), and multiplying by 12. An annual availability during the Drought of Record was calculated to be 14,486 ac-ft/yr for this strategy, and it is assumed to come online beginning in 2040.

The following infrastructure was proposed:

- Four (4) recharge basins 600' wide x 1,500' long x 4' high
- Simple Intake Structure with pipe extending to existing canal
- Two (2) Pump Stations
- Approximately 0.5 miles of transmission piping and appurtenances
- Combination of 28 new and 27 leased wells

Cost Implications of Proposed Strategy

A capital cost estimate was provided by LCRA from a preliminary feasibility analysis. The capital cost estimate was in August 2011 dollars. In order to provide a comparable cost consistent with other strategies in this report, costs were adjusted to September 2018 dollars using the ENR Construction Cost Index. In order to keep the costing similar to other projects, the intake and pump station costs were calculated using the TWDB Costing Tool instead of the costs provided, as the costs provided were far smaller than what the TWDB Costing Tool calculates. The capital cost for this strategy is primarily driven by the cost of the recharge basins and well fields.

In addition, engineering, legal, environmental, and land acquisition costs were also taken from the analysis and updated to September 2018, as they were higher than what the TWDB Costing Tool generated. Remaining costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost

Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars. The following table shows the estimated costs associated with this strategy.

Table 5.41: LCRA Enhanced Recharge Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$47,285,000	$71,125,000	$5,428,000	$375

Environmental Considerations

If a new junior water right is used, instream flow and freshwater inflow requirements would be met before water can be diverted, thereby limiting impacts to the environment. Pulse flows in the river could potentially be reduced by up to 18,000 ac-ft/yr.

Agricultural & Natural Resources Considerations

Positive impacts of up to 18,000 ac-ft/yr to agriculture are expected as a result of implementing this strategy, due to the ability to provide water supply for agricultural purposes that can be accessed during drought periods.

5.2.3.1.14. Off-Channel Reservoirs

Mid-Basin Reservoir

The purpose of an off-channel reservoir (OCR) is to capture available flows from the Colorado River that are not needed to meet senior water rights or environmental flow obligations. The source of the water would be diversions under existing water rights, although a water right permit amendment would be required to authorize diversion and storage of available flows at a mid-basin location. For planning purposes, this reservoir is assumed to be located in Bastrop County The demands served by this strategy would be municipal, industrial, agricultural, environmental flows, and other beneficial uses near the site and downstream. The firm yield for this strategy is projected to be about 20,000 ac-ft/yr and is not projected to come online until 2030.

Table 5.42: LCRA Mid-Basin Reservoir Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	20,000	20,000	20,000	20,000	20,000

Cost Implications of Proposed Strategy

For planning purposes, costs for this strategy were estimated based on the information provided by LCRA for the LCRA Lower Basin Off-Channel Reservoir capital costs during the 2016 planning cycle. The Mid-Basin OCR is assumed to have the same capacity and design as the Lower Basin OCR. To calculate the cost of the reservoir alone, the estimate for the Lower Basin Reservoir was converted from 2013 to 2018 dollars. Costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

Infrastructure used to estimate costs for this strategy include:

- 40,000 ac-ft capacity off channel reservoir
- 9,000-ft pipe, intake, and pump station pumping water from river to reservoir
- 9,000-ft pipe, intake, and pump station to return flows
- 56-mile transmission pipe, intake, pump station and booster station to deliver water to point of use

The following table shows the estimated costs associated with this strategy.

Table 5.43: LCRA Mid-Basin Reservoir Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$356,045,000	$512,792,000	$46,993,000	$2,350

Environmental Considerations

The Mid-Basin Off-Channel Reservoir is off-channel and would rely on capturing available river flows under existing amended water rights for its yield. Thus, environmental impacts compared to an on-channel reservoir are minimal. In addition, the reservoir will enhance LCRA's ability to manage flows in the river, including releases to Matagorda Bay, managed waterfowl habitat, and coastal wetlands.

The environmental impacts to instream flows and bay and estuary inflows were analyzed for this project as part of the 2016 Region K Plan. Because the reservoir uses existing water rights, the instream flows showed some variation, both increases and decreases, as compared to a model without the reservoir. Certain assumptions were included in this analysis. Future changes to how LCRA might manage its system could change the variations. This strategy could potentially remove up to 20,000 ac-ft/yr from the Colorado River under existing water rights but will create additional waterfowl habitat.

Agricultural & Natural Resources Considerations

Agricultural users in the lower Colorado River Basin predominantly rely on interruptible water supply provided from ROR rights and stored water released from the Highland Lakes. Due to current historic drought in the Basin, characterized by low inflows and reservoir storage condition, interruptible water releases from the Highland Lakes for agricultural use were largely stopped after 2011, with the exception of the Garwood operations. The construction of the Mid-Basin Off-Channel will lessen the need to release Highland Lakes' water to meet firm water demands near the coast and could improve interruptible agricultural water reliability and efficiency. The new reservoir will increase LCRA's operational flexibility, which, in turn, has the potential to enhance the water availability in the lower basin for a variety of purposes, including agriculture. This strategy could potentially make available up to 20,000 ac-ft/yr of water for agricultural purposes, depending on firm customer needs.

Prairie Site Regulating Reservoir

This strategy consists of a new earthen ring dike off-channel reservoir with 2,000 ac-ft of storage located near Eagle Lake in Colorado County, approximately three miles from the Colorado River.

The proposed off-channel regulating reservoir would provide operational flexibility for LCRA in providing water to the Lakeside Irrigation Division customers. The Prairie Site Reservoir would release flows to the Lakeside agricultural division canals. Water would be stored when demand for irrigation is reduced (e.g., due to rain events or other weather events) and then used later when demand for irrigation water increased. The source of the water is diversions from the Colorado River under LCRA's existing water rights.

This strategy would provide other benefits. Currently, when water is released from the Highland Lakes to downstream water users, it takes several days to reach those users, because the lakes are far from the point of use. If it rains in the time it takes for the stored water to get from the release point to the point of use, the released stored water may no longer be needed at that time but could be captured and stored in the off-channel reservoir to be beneficially used at a later time in lieu of additional releases of stored water. Additionally, since this off-channel reservoir would be located a shorter distance to the users than the existing release points, released water from this reservoir would reach the users sooner.

The infrastructure required to implement this strategy includes:

- New 2,000 ac-ft storage capacity earthen ring dike reservoir
- Connecting canal from the Prairie Canal to the reservoir
- Canal improvements (i.e., shaping, grading, and raising of a portion of the canal banks)
- Check structure and low-head pumps to convey and lift flow from the Prairie Canal to the reservoir
- 36-inch-diameter culvert addition at the canal crossing the railroad and FM 102
- 60-inch-diameter culvert replacement at the transfer point from the Prairie system to the Main system at FM 1093
- Spillway for conveyance of flood flows from rainfall events
- Energy dissipation structures for discharge into the reservoir and return flow into Prairie Canal

The conserved water from this strategy is projected to be an estimated of up to 19,000 ac-ft/yr for interruptible agricultural supply. The conserved water volume decreases over time due to the decrease in interruptible supplies. This strategy could be online by the year 2030.

Table 5.44: LCRA Prairie Site Regulating Reservoir Yield

Water Management Strategies (ac-ft/yr)					
2020	2030	2040	2050	2060	2070
0	19,000	9,500	0	0	0

Cost Implications of Proposed Strategy

Costs for this strategy were developed based on information provided by LCRA. Consistent with the Texas Water Development Board (TWDB) Cost Estimating Tool, all costs are given in September 2018 dollars. The following table shows the estimated costs associated with this strategy.

Table 5.45: LCRA Prairie Site Regulating Reservoir Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$10,235,000	$16,690,000	$944,000	$50

Environmental Considerations

The Prairie Reservoir is a relatively small, off-channel reservoir that would rely on utilizing existing water rights and capturing available river flows for its conservation benefit. Thus, environmental impacts, as compared to an on-channel reservoir, are minimal. In addition, the reservoir will enable LCRA to enhance its ability to manage flows in the lower portion of the Colorado River, and to manage waterfowl habitat and coastal wetlands.

Agricultural & Natural Resources Considerations

Agricultural users in the lower Colorado River Basin predominantly rely on interruptible water supply provided from ROR rights and stored water released from the Highland Lakes. Due to recent historic drought in the basin, characterized by low inflows and reservoir storage condition, interruptible water releases from the Highland Lakes for agricultural use were largely stopped between 2012 and 2015, with the exception of the Garwood operations. The construction of the Prairie Reservoir will help improve interruptible agricultural water reliability and efficiency. The new reservoir will increase LCRA's operational flexibility, which, in turn, has the potential to enhance the water availability in the lower basin for a variety of purposes, including agriculture. This strategy could potentially make available up to 19,000 ac-ft/yr of interruptible water for agricultural purposes within the Lakeside operations.

Impacts on Other Water Resources in the State

Because of the small size of the regulating reservoir, minimal impacts to downstream flows are expected as a result of implementing this strategy.

Excess Flows Reservoir

LCRA holds TCEQ Water Use Permit No. 5731, which authorizes LCRA to divert, store, and use for various beneficial purposes up to 853,514 ac-ft/yr from the Colorado River, subject to significant environmental flow requirements, into one or more off-channel reservoirs (up to 500,000 ac-ft of off-channel storage) located within Colorado, Wharton, and Matagorda counties. By April 2021, LCRA must apply for an amendment to the permit to either authorize specific off-channel reservoir(s) or extend the time for filing an amendment to authorize the specific reservoir(s). No location and size are yet determined, but for cost estimating purposes and assignment with the TWDB database, Colorado County is used as the location, and the size is expected to be comparable to the Arbuckle off-channel reservoir at 40,000 ac-ft, although it could be smaller or larger. This facility is one of a potential series of reservoirs that are authorized under this permit. This proposed strategy differs from two of the other potential off-channel reservoirs LCRA is considering (Prairie and Mid-Basin OCR) in that the TCEQ Permit No. 5731 already authorizes the storage facility, subject to a permit amendment specifying its location, and various other requirements, including but not limited to dam safety review. It is also possible that, in lieu of a separate additional off-channel reservoir, the Excess Flows Permit could be used in conjunction with other water rights as a source of supply for the Prairie Site or Arbuckle reservoirs.

The purpose of an off-channel reservoir is to capture available river flows not needed downstream and store the captured water for later use. The reservoir could supply water directly to end users, or release water back to the river for use downstream. The demands served by this strategy could range from municipal and industrial uses to agricultural users near the coast, and environmental flow needs.

This strategy would provide other benefits. Currently, when water is released from the Highland Lakes to downstream water users, it takes several days to reach those users, because the lakes are far from the point of use. If it rains in the time it takes for the water to get from the release point to the point of use, the Highland Lakes water may no longer be needed at that time but could be captured and stored in the off-channel reservoir to be beneficially used at a later time in lieu of additional releases of Highland Lakes water. Additionally, since this off-channel reservoir would be located a shorter distance to the users than the existing release points, released water from this reservoir would reach the users sooner.

The projected yield from this strategy was determined using the Region K Cutoff Model and is shown by decade in *Table 5.46.*

Table 5.46: LCRA Excess Flows Reservoir Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	39,247	39,247	39,247	39,247	39,247

Cost Implications of Proposed Strategy

For planning purposes, costs for this strategy were based on a storage capacity of 40,000 ac-ft, although this may not be the final storage capacity, as discussed. The cost for the off-channel reservoir was estimated by taking the 2014 cost from the preliminary engineering estimate for the LCRA Lower Basin Off-Channel Reservoir (which also has a capacity of 40,000 ac-ft) and converting from 2014 to 2018 dollars using the construction cost index, on the assumption that the Excess Flows OCR will have a similar design. Costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars. The following table shows the estimated costs associated with this strategy.

Infrastructure used to estimate costs for this strategy includes:

- 40,000 ac-ft capacity off channel reservoir
- 9,000-ft pipe, intake, and pump station pumping water from river to reservoir
- 9,000-ft pipe, intake, and pump station to return flows
- 56-mile transmission pipe, intake, and pump station to deliver water to point of use

Table 5.47: LCRA Excess Flows Reservoir Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$377,094,000	$540,110,000	$48,713,000	$1,241

Environmental Considerations

The Excess Flows Off-Channel Reservoir is off-channel and would rely for its yield on capturing river flows available only after meeting significant instream flow and freshwater inflow requirements. Due to the environmental restrictions in the permit, diversions are not expected to have any significant environmental impacts. In addition, the reservoir will enhance LCRA's ability to manage flows in the lower basin, including potential use of the water for managed waterfowl habitat and, with further amendments, water stored in the reservoir might be released to help meet inflow needs of Matagorda Bay. This strategy could potentially remove up to 39,247 ac-ft/yr from the Colorado River.

Agricultural & Natural Resources Considerations

Agricultural users in the lower Colorado River Basin predominantly rely on interruptible water supply provided from ROR rights and stored water released from the Highland Lakes. Due to the recent historic drought in the basin, characterized by low inflows and reservoir storage condition, interruptible water releases from the Highland Lakes for agricultural use were largely stopped from 2012 to 2015, with the exception of the Garwood operations. The construction of the Excess Flows Off-Channel Reservoir will lessen the need to release Highland Lakes' water to meet firm water demands near the coast and improve interruptible agricultural water reliability and efficiency. The new reservoir will increase LCRA's operational flexibility, which, in turn, has the potential to enhance the water availability in the lower basin for a variety of purposes, including agriculture. This strategy could potentially make available up to 39,247 ac-ft/yr of water for agricultural purposes, depending on firm customer needs.

5.2.3.1.15. Downstream Return Flows

Downstream return flows from Pflugerville are discussed in *Section 5.2.1.2*. This benefit is assigned to LCRA, and through a bed and banks permit, the return flows could be transported to a diversion location for an LCRA customer or to be stored in an off-channel reservoir.

5.2.3.2 Austin Water Management Strategies

Austin provides water for municipal, manufacturing, and steam-electric water uses. Austin's existing service area covers portions of Travis, Williamson, and Hays Counties. Austin water management strategies and total water amounts for each strategy are summarized in the following table.

Table 5.48: Summary of Austin Water Management Strategies (ac-ft/yr)

Recommended Strategy	2020	2030	2040	2050	2060	2070
Municipal and Manufacturing						
Drought Management	8,266	9,708	11,281	12,423	13,389	14,666
Conservation	4,910	14,890	24,870	30,120	35,370	40,620
Blackwater and Greywater Reuse	0	1,450	3,450	5,400	7,340	9,290
Aquifer Storage and Recovery	0	0	7,900	10,500	13,200	15,800
Off-Channel Reservoir and Evaporation Suppression	0	0	0	0	0	25,827
Onsite Rainwater and Stormwater Harvesting	0	790	1,880	2,890	3,890	4,900
Community-Scale Stormwater Harvesting	0	66	158	184	210	236
Brackish Groundwater Desalination	0	0	0	0	0	5,000
Centralized Reclaimed Water Capacity (Direct Reuse)	500	2,990	10,250	14,583	18,917	23,250
Decentralized Direct Non-Potable Reuse	0	1,400	4,160	8,330	12,510	16,680
Capture Local Inflows to Lady Bird Lake	0	0	3,000	3,000	3,000	3,000
Longhorn Dam Operation Improvements	0	3,000	3,000	3,000	3,000	3,000
Total	**13,676**	**34,294**	**69,949**	**90,430**	**110,826**	**162,269**
Strategies to be Implemented under Drought Conditions only						
Indirect Potable Reuse through Lady Bird Lake	0	0	11,000	14,000	17,000	20,000
Lake Austin Operations	2,500	2,500	2,500	2,500	2,500	2,500
Total	**2,500**	**2,500**	**13,500**	**16,500**	**19,500**	**22,500**
Steam-Electric						
LCRA Contract Amendment	4,300	4,300	4,300	4,300	4,300	4,300
Centralized Reclaimed Water Capacity (Direct Reuse)	0	1,750	1,750	1,750	1,750	1,750
Total	**4,300**	**6,050**	**6,050**	**6,050**	**6,050**	**6,050**
Total of All Categories	**20,476**	**42,844**	**89,499**	**112,980**	**136,376**	**190,819**

5.2.3.2.1. Water Conservation

The Austin Conservation strategy is discussed in detail in the Conservation Section, specifically *Section 5.2.2.2*, as required by the TWDB.

5.2.3.2.2. Blackwater and Greywater Reuse

For the purpose of this evaluation, Austin Water defines Greywater Reuse as the reuse of water from the laundry, shower, bathroom lavatory, and bath at the lot/unit scale to meet non-potable demands. There are two main types of reuse: greywater diversion and graywater treatment systems. Greywater diversion systems typically include a surge-tank, filter, and a pump (if needed). Greywater treatment systems include treatment, storage and a pump. Depending on the level of treatment, greywater can be used for a variety of applications, including irrigation, toilet flushing, and clothes washing. In establishing typical yields and costs for this strategy as part of the Austin Water Forward Plan, Austin Water assumed a proportion of newly constructed buildings would be equipped in the following manner:

- Single-family residences with greywater diversion for outdoor end use
- Single-family and multi-family residences with greywater treatment for outdoor, toilet flushing, and clothes washing end uses
- Commercial buildings with greywater treatment for outdoor irrigation, toilet flushing, and cooling water

For the purpose of this evaluation, Austin Water defines Lot-Scale Wastewater Reuse (or ‘Blackwater Reuse”) as the onsite capture and treatment of the wastewater stream generated from a building for onsite reuse via a dual plumbing system to supply outdoor demands (ex: irrigation/landscaping) and non-potable indoor demands (ex: toilets, clothes washing, cooling towers). Blackwater treatment plants are most commonly installed in commercial buildings and high density, multi-story multi-family residential buildings. Treatment may be one or a combination of membrane bioreactor, moving bed biofilm reactor, passive (e.g. engineered wetlands) or other systems, with microfiltration or ultrafiltration, and ultraviolet disinfection and/or chlorination. Wastes (sludge) from the treatment process are typically discharged back to the wastewater network.

In establishing typical yields and costs for this strategy, the following is assumed:

- A proportion of newly constructed multi-family residences and commercial buildings will be equipped with a blackwater treatment system supplying outdoor and non-potable indoor end uses.

Combined as a single strategy, Blackwater and Greywater Reuse are expected to provide approximately 9,290 ac-ft/yr of new water supply by 2070. Water availability through this strategy is consistent throughout the year but limited to the storage capacity of each system. Back-up supply from the central water system is required to provide adequate supply. The strategy is expected to be online by 2030.

Table 5.49: Austin Blackwater and Greywater Reuse Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	1,450	3,450	5,400	7,340	9,290

Cost Implications of Proposed Strategy

Estimates for capital and O&M costs were provided by Austin, from data in their Austin Water Forward Plan. Estimates for facilities costs totaled approximately $40,000,000 and annual O&M costs totaled approximately $47,000,000. These costs are what the site developer would incur and are below the WUG level. As such, regional water planning guidelines do not allow these costs to be included in the regional water plans. It should be noted that Austin Water may offset some of the costs of these systems through incentives.

Project costs for this strategy for regional water planning purposes are $0. Please refer to the Austin Water Forward Plan for detailed information on costs and infrastructure required at the developer level.

Environmental Considerations

Assuming the proposed building- and lot-scale treatment technologies incur small footprints, this strategy provides environmental benefit by reducing the energy spent transmitting wastewater from far reaches of the collection system to existing centralized wastewater treatment plants.

No outdoor end uses for this strategy are proposed for sensitive recharge areas, including the Edwards Aquifer Recharge Zone.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.3.2.3. Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) is a strategy in which water is stored in an aquifer during wetter periods and recovered for use during drier periods. ASR offers an opportunity to improve water supply during drought and to reduce evaporative losses through the concept of "water-banking." By storing water underground, losses to evaporation incurred by above-ground storage reservoirs (lakes) are avoided. This type of strategy is currently being used by cities in the U.S. and Texas including San Antonio, Kerrville, and El Paso.

Per the Austin Water Forward Plan, treated Colorado River water under Austin's existing water rights and contract agreements is the proposed source of water for this strategy, particularly during non-drought years. Generally, in any month, if there is vacant storage capacity in the ASR and if there are unused portions of Austin's water authorizations, then treated water will be diverted from existing water treatment plant infrastructure to the storage aquifer. Per their 1999 agreement with the Lower Colorado River Authority (LCRA), Austin is authorized to withdraw a total of 325,000 ac-ft/yr of water from the Colorado River. In general, unutilized portions of the authorization on an annual basis are made available to the ASR strategy, along with the unutilized portions of other Austin water rights. According to the Austin Water Forward Plan, in order to fully utilize Austin's water rights to meet demands under the 1999 contract, it is likely that water right amendments will be required if this strategy is implemented.

A number of potential storage aquifers will be considered for the strategy. Since the last regional water planning cycle, Austin has performed feasibility analyses to better understand the hydrogeology of the Northern Edwards and Trinity Aquifers in order to evaluate potential for recharge and extraction. The analyses found that current regulatory restrictions would prevent injection into or transection of the Edwards Aquifer. The Carrizo-Wilcox Aquifer has been identified as a candidate for storage, given its favorable hydrogeological properties and the San Antonio Water System's experience with an ASR facility in this aquifer.

As part of this strategy, Austin will construct and implement a pilot facility in order to assess the storage capacity, recovery capacity, migration losses, and other characteristics of the aquifer. Analysis of treatment requirements to provide acceptable water quality for aquifer injection and for distribution will be conducted. Results from this pilot project will inform decisions about the full-scale ASR facility.

The initial phase of the full-scale ASR strategy is planned to be online by 2040 with a storage volume of 60,000 ac-ft and the capacity to withdraw about 7,900 ac-ft/yr on average over the critical period of the drought of record and up to 60,000 ac-ft in a maximum withdrawal year. By 2070, this strategy is expected to have a storage volume of 120,000 ac-ft and provide an average of 15,800 ac-ft/yr over the critical period of the drought of record and up to approximately 60,000 ac-ft in a maximum withdrawal year. Expanded supplies are planned to be available by 2115. Piping from the water source to the wells and from the wells to the distribution system will be required. Significant land acquisition by Austin may be required for the aquifer storage and recovery wells and other facilities. Control of injected water may present challenges, and additional land acquisition or other protections may be necessary to ensure that stored water is protected.

Conceptually, the purpose of ASR is to provide additional water supplies in times of drought or other unforeseen events. Water availability from the ASR is dependent on several factors. Because the aquifer is acting as a "water-bank," its capacity to provide water in times of drought is dependent on the degree that surface water was successfully stored in the aquifer, generally in wetter years. The estimated average over the critical period of the drought of record yields are shown in the following table.

Table 5.50: Austin Aquifer Storage and Recovery Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	0	7,900	10,500	13,200	15,800

Cost Implications of Proposed Strategy

Capital costs were provided by Austin. In order to provide a comparable cost consistent with other strategies in this report, annual costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars. The Cost Estimating Tool was also used to determine operating costs.

Capital costs associated with this strategy include:

- Reversible pipeline (38-mile estimate)
- Wells (1800 gpm @1600 ft each)
- Pump Station (Into Aquifer 850 HP, Out of Aquifer 1650 HP)
- Land acquisition
- Treatment to drinking water quality prior to storage in aquifer
- Pilot testing

The following table shows the estimated costs associated with this strategy.

Table 5.51: Austin Aquifer Storage and Recovery Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$248,350,000	$370,527,000	$35,300,000	$2,234

Environmental Considerations

The ASR strategy will require permitting to ensure it complies with all environmental considerations. Project planning will include identification of permit requirements, including environmental permitting, to implement the strategy.

Water to be stored in the ASR facility is planned to come from Austin's existing distribution infrastructure and was therefore modeled as being diverted from the river at any of Austin's existing water treatment plants. In general, if there is vacant storage capacity in any month in the ASR and if there are unused portions of Austin's available water, then water could be diverted for injection into the ASR. In preliminary conceptual planning for this strategy, instream flow conditions were checked for the water rights with new diversion points before the ASR was modeled as diverting water. This strategy helps satisfy a component of City of Austin demands already anticipated to be met through Colorado River diversions, particularly during drought and low reservoir storage volume conditions in lakes Travis and Buchanan. Although to store water in the aquifer more water may be diverted in a particular year than otherwise would have been diverted, this would be done in a wetter year when water is typically available to the environment. In certain drought years demand for river diversions may be able to be reduced while water is being drawn out of ASR to meet demands. As a result, impacts to environmental flows should be minimal.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Impacts to agriculture should be considered negligible. Water storage in the ASR is driven by the availability of excess surface water flows in years of non-drought. The pumping of water into the ASR is anticipated to be conducted in wetter periods when water is typically available to other users in the basin. Therefore, this strategy is anticipated to have negligible effects on other users.

5.2.3.2.4. Off-Channel Reservoir and Evaporation Suppression

This strategy involves the construction of a new off-channel reservoir (OCR) in the Austin region that Austin Water would own and operate. The purpose of the off-channel reservoir is to capture river flows when available under Austin's water rights and store the captured water for later use. This strategy helps satisfy a component of Austin demands already anticipated to be met through Colorado River diversions, particularly during drought and low reservoir storage volume conditions in lakes Travis and Buchanan.

Per the 1999 contract with the Lower Colorado River Authority (LCRA), Austin is to utilize water under its own Colorado River water rights before drawing on stored water from LCRA. This contract is a combination of Austin's run-of-river rights with backup and additional water from LCRA for a firm water total of up to 325,000 ac-ft/yr. Unutilized portions of Austin's water rights are made available to the OCR strategy. According to the Austin Water Forward Plan, in order to fully utilize Austin's water rights as part of this OCR project, it is likely that water right amendments will be required for this strategy.

Potential implementation issues for the OCR include significant land area requirements and that the yield of the reservoir is dependent on the reliability of flow in the Colorado River.

Additionally, the OCR project includes an evaporation suppression strategy to reduce natural evaporation from the open-air off-channel reservoir. Per the TWDB's Water Data for Texas tool, open reservoirs in the Austin area can lose up to 8 inches of water to evaporation in the summer months. There are different ways to suppress evaporation, and various options will be explored. Evaporation suppression options including solar panels, plastic balls, monomolecular layer powders, among others, would be planned to be considered.

This strategy is expected to provide approximately 25,827 ac-ft/yr by 2070, per the Austin Water Forward Plan dated 2018. This is based on 25,000 ac-ft/yr for the reservoir, and 827 ac-ft/yr for the evaporation suppressant. Assuming the suppressant is effective, this strategy would act as a "water bank," accumulating water in wetter years and providing supplemental supply in times of drought.

The estimated yield for these strategies is shown in *Table 5.52*.

Table 5.52: Austin Off-Channel Reservoir and Evaporation Suppression Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	0	0	0	0	25,827

Cost Implications of Proposed Strategy

Capital and O&M costs were provided by the Austin Water Forward Plan, dated 2018. In order to provide a comparable cost consistent with other strategies in this report, annual costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars.

Capital costs associated with this strategy include:

- 25,000 ac-ft off channel reservoir
- River intake
- Pump station and pipeline (river to reservoir)
- Pump station and pipeline (reservoir to point of use)
- Appurtenances of evaporation suppressant application

Table 5.53 shows the estimated costs associated with this strategy.

Table 5.53: Austin Off-Channel Reservoir and Evaporation Suppression Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$226,171,000	$334,642,000	$25,444,000	$1,018

Environmental Considerations

According to the Austin Water Forward Plan, in order to fully utilize Austin's water rights as part of this OCR project, it is likely that water right amendments will be required for this strategy. In preliminary conceptual planning for this strategy, instream flow conditions were checked before the OCR was modeled as diverting water. A conservative estimate of water availability was used to avoid impacts to existing streamflow requirements. This strategy helps satisfy a component of Austin demands already anticipated to be met through Colorado River diversions, particularly during drought and low reservoir storage volume conditions in lakes Travis and Buchanan. Although to store water in the OCR more water may be diverted from the river in particular conditions than otherwise would have been diverted, however, this would be done in wetter conditions when water is typically available to the environment. In certain drought periods demand for river diversions may be able to be reduced while water is being drawn out of OCR to meet demands.

Environmental studies and permits may be needed to address potential impacts of evaporation suppression options including assessment of impact on oxygen transfer between water and air, lake temperature, source water quality, waterfowl, and aquatic life.

Agricultural & Natural Resources Considerations

Negligible impacts to agriculture are expected as a result of implementing this strategy. The pumping of water into this reservoir is anticipated to be conducted during high flow events when water is typically available to other users in the basin. In addition, most of the pumping would occur in high flow events during drought periods when interruptible customers would be expected to be cut off, per LCRA's Water Management Plan. Therefore, this strategy is anticipated to have negligible effects on other users.

Additional study is needed to evaluate various evaporation suppression options to ensure the effectiveness and safety of the chosen technology. Monitoring would be necessary to ensure public safety and efficacy of the evaporation suppression technology.

5.2.3.2.5. Onsite Rainwater and Stormwater Harvesting and Community-Scale Stormwater Harvesting

Lot-Scale Rainwater Harvesting involves the capture and storage of roof water to supply a range of onsite demands at the lot/building scale. Lot-Scale Stormwater Harvesting involves the capture and storage of stormwater runoff generated from impervious surfaces (including water from paved surfaces and roof water) within the lot boundary of developments to supply a range of onsite demands at the lot/building scale. Community Scale Stormwater Harvesting involves the collection of stormwater runoff from urban areas (e.g. impervious surfaces including roads, pavements and roofs), for treatment and reuse for irrigation/landscaping or reuse for dual pipe systems at the community scale. The implementation of either as a water management strategy is dependent upon the catchment area, storage capacity, rainfall frequency and water demand of the end user. On average, the Austin area generally receives about 32 inches of rainfall per year. This rainfall is not distributed uniformly during the year and, as a result, implementation of rainwater and stormwater harvesting as a water management strategy should consider water demands and supplies over a multi-month period. The Austin Water Forward Plan's Onsite Rainwater and Stormwater and Community-Scale Stormwater Harvesting strategy accounts for this variation by analyzing historical rainfall data from 1938-2016.

For existing buildings, retrofitting structures with internal connections to a dual supply source can be cost prohibitive and/or practically difficult. The Austin Water Forward Plan has assumed that stormwater harvesting at the community scale and lot scale for existing development would generally be used for irrigation/landscaping.

Onsite Rainwater and Stormwater Harvesting

For Lot-Scale Stormwater and Rainwater Harvesting, it is assumed existing buildings will only apply harvested stormwater to irrigation. For the future, however, Austin's Water Forward Plan strategies include phased use of dual plumbing and internal connections for non-potable end uses including toilet flushing, and cooling towers for new development, initially focusing on large-scale commercial development. While catchment areas for rainwater and stormwater systems vary based on lot size and percent of impervious cover, the Austin strategy assumes a typical roof catchment area of 1,500-3,700 SF for single-family residences, 5,000 SF for a nominal multi-family residential building and 10,000 SF for a nominal commercial building.

In establishing typical yields for this strategy, Austin assumed the installation of rainwater and stormwater harvesting systems in a portion of new and existing buildings equipped in the following manner:

- Rainwater Harvesting
  - Single-family residences with outdoor end use
  - Multi-family residences with outdoor end use and indoor (non-potable) toilet flushing end use
  - Commercial buildings with outdoor end use and indoor (non-potable) toilet flushing and cooling water end uses
- Stormwater Harvesting
  - Multi-family residences and commercial buildings with outdoor end use

This strategy is expected to provide 4,900 ac-ft/yr by 2070, per the Austin Water Forward Plan. Water availability for this strategy is dependent on rainfall, storage sizing, and end use demands. While Austin Water already offers rebates for rainwater systems, the Austin Water Forward Plan provides a supply projection of an additional 790 ac-ft/yr by 2030. The estimated combined yield during a drought year for these strategies is shown in *Table 5.54*.

Table 5.54: Austin Onsite Rainwater and Stormwater Harvesting Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	790	1,880	2,890	3,890	4,900

Cost Implications of Proposed Strategy

Estimates for capital and O&M costs were provided by Austin, from data in their Austin Water Forward Plan. Estimates for facilities costs totaled approximately $10,000,000. Estimates for O&M costs, including the pumping energy costs, totaled approximately $4,785,000. These costs are what the homeowner or site developer would incur and are below the WUG level. As such, regional water planning guidelines do not allow these costs to be included in the regional water plans. It should be noted that Austin Water may offset some of the costs of these systems through incentives.

Project costs for this strategy for regional water planning purposes are $0. Please refer to the Austin Water Forward Plan for detailed information on costs and infrastructure required at the homeowner/developer level.

Environmental Considerations

No environmental impacts are expected as a result of implementing this strategy. Rainwater and stormwater harvesting can provide environmental benefit due to the relatively short distance between the rainwater storage and the end use on the property, reduced energy requirements due to gravity fed collection systems, and the small footprints of storage tanks. Additionally, rainwater and stormwater harvesting can provide environmental benefit by reducing runoff during large storm events.

In some states, water right authorizations or permits are required for rainwater harvesting projects. Texas, however, does not require authorization for rainwater harvesting projects.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

Impacts on Other Water Resources of the State

The Austin Water Forward Plan assumes relatively small-scale implementation of this strategy. There are no impacts are expected on other Water Resources of the State at the proposed scale of implementation.

Community-Scale Stormwater Harvesting

Austin Water has assumed that stormwater harvesting at the community level for existing developments would be used solely for irrigation/landscaping, however other configurations could be considered in the future.

Catchment areas for existing developments are calculated from Travis County Contours 2012 (dataset obtained from the Austin Open Data Portal). For new development areas, the development itself is taken as the stormwater catchment. The Runoff Coefficient is assumed to be 0.9. Tank volumes are optimized from yield/storage curves in order to maximize yield and minimize cost and tank footprint.

In establishing typical yields and costs for this strategy, Austin assumed the installation of stormwater harvesting systems in a proportion of new and existing buildings equipped in the following manner:

- Existing single-family residences, multi-family residences, and commercial buildings with outdoor end use
- Newly constructed single-family residences, multi-family residences, and commercial buildings with outdoor end use and indoor (non-potable) toilet flushing, clothes washing, and cooling water

This strategy is expected to provide approximately 236 ac-ft/yr by 2070, per the Austin Water Forward Plan dated 2018. Water availability is dependent on rainfall, storage sizing, and end use demands. However, historical average monthly rainfall is above 2 inches, providing a relatively small but consistent supply. This strategy is expected to begin providing supply in 2030.

The estimated combined drought yield for these strategies is shown in *Table 5.55*.

Table 5.55: Austin Community-Scale Stormwater Harvesting Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	66	158	184	210	236

Cost Implications of Proposed Strategy

Estimates for capital and O&M costs were provided by Austin, from data in their Austin Water Forward Plan. Estimates for facilities costs totaled approximately $200,000. Estimates for O&M costs, including the pumping energy costs, totaled approximately $107,000. These costs are what the site developer would incur and are below the WUG level. As such, regional water planning guidelines do not allow these costs to be included in the regional water plans. It should be noted that Austin Water may offset some of the costs of these systems through incentives.

Project costs for this strategy for regional water planning purposes are $0. Please refer to the Austin Water Forward Plan for detailed information on costs and infrastructure required at the developer level.

Environmental Considerations

Environmental impacts as a result of implementing this strategy are expected to be negligible. Additionally, rainwater and stormwater harvesting can provide environmental benefit by reducing runoff during large storm events.

Quality Considerations

No impacts to water quality are expected as a result of implementing this strategy.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

Impacts on Other Water Resources of the State

Austin has assumed relatively small-scale implementation of this strategy, however, if large-scale adoption were to occur, localized capture of stormwater could reduce flows to downstream surface water bodies. This reduction can be seen as a benefit, as it reduces the negative impacts of peak storm flows (reduced water quality, flooding, etc.).

5.2.3.2.6. Brackish Groundwater Desalination

Austin Water's Water Forward Plan includes brackish groundwater desalination as a strategy for the 2070 planning horizon. Brackish groundwater is defined as groundwater containing between 1,000 and 9,999 milligrams per liter (mg/L) of total dissolved solids. To be utilized for potable use, brackish groundwater may be desalinated or blended with another source water with low total dissolved solids. Texas has already begun implementing brackish groundwater desalination projects, including the commissioning of a 27.5

MGD project by the City of El Paso in 2007 and a 12 MGD project by the San Antonio Water System in 2016.

The specific process used to desalinate water varies depending upon the total dissolved solids, the temperature, and other physical characteristics of the source water, but always requires disposal of concentrate, called brine, that has a higher total dissolved solids content than the source water. Austin Water has identified the following aquifers as potential sources for brackish groundwater: the Edwards, Trinity, Gulf Coast, and Carrizo-Wilcox Aquifers. While Austin Water has not yet selected the aquifer source for this strategy, costs and yields were estimated based on extraction from the Trinity Aquifer and the saline portion of the Edwards Aquifer.

This strategy is expected to provide approximately 5,000 ac-ft/yr by 2070 total, as shown in the table below. Supplies would come from two sources: 2,300 ac-ft/yr from the Trinity Aquifer and 2,700 ac-ft/yr from the Saline Edwards Aquifer. If the volumes are split between the Saline Edwards and the Trinity Aquifers, the full 5,000 ac-ft/yr can be supplied without exceeding each aquifer's MAG. Per the Austin Water Forward Plan, the strategy is expected to be online by 2070, with plans for expanded capacity to 16,000 ac-ft/yr by 2115.

Table 5.56: Austin Brackish Groundwater Desalination Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	0	0	0	0	5,000

Water availability and quality for this strategy is dependent on the selection of source aquifer and utilization rates. Per the TWDB Report 276 (see p. 97, Fig. 12, and Fig. 24), favorable areas for extraction from the Trinity Aquifer within Travis County are located west of Central Austin, and include the upper, middle, and lower Trinity Aquifers. Yields from the lower Trinity Aquifer are "small to moderate and the water is fresh to moderately saline in quality" (500-6,000 mg/L TDS). The middle and upper Trinity Aquifers generally have "lower yields and permeabilities than the lower Trinity, but provide better quality," and are consistently fresh in large pockets. To achieve a yield of 2,300 ac-ft/yr, Austin will likely pursue extraction from the lower Trinity, given its higher yields. Additional information on groundwater availability and quality of the Trinity Aquifer in Travis County may be found in TWDB Report 276.

According to the Barton Springs/Edwards Aquifer Conservation District (BS/EACD), *BS/EACD Report of Investigations 2017-1015*, water sampled from the saline part of Edwards Aquifer in Southeast Travis County ranged from 8,877 mg/L to 18,622 mg/L. Per the same report, "estimates indicate relatively high-yielding wells are possible in the Saline Edwards, with yields greater than 1,000 gpm," indicating that Edwards Aquifer Saline Zone is favorable for extraction. Due to the higher total dissolved solids content of yields from Edwards Aquifer, treatment facilities must be suitable for nearly saline water.

Cost Implications of Proposed Strategy

Facilities and O&M costs were provided by the Austin Water Forward Plan, dated 2018. Costs were updated based on the inclusion of two wellfields in different aquifers, versus one in the Austin Water Forward Plan. In order to provide a comparable cost consistent with other strategies in this report, annual costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars.

Infrastructure costs associated with this strategy include:

- Two (2) wellfields, one for the Trinity Aquifer and one for the Saline Edwards Aquifer
- Pump station
- Storage tank
- Reverse osmosis treatment facilities
- Evaporation ponds for disposal
- Land acquisition

The following table shows the estimated costs associated with this strategy.

Table 5.57: Austin Brackish Groundwater Desalination Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$86,547,000	$167,689,000	$14,976,000	$2,995

Environmental Considerations

Environmental permits will need to be obtained for the disposal of concentrate brine.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Additionally, desalination facilities generally require greater energy demands in comparison to surface or low total dissolved solids (TDS) groundwater facilities. Austin would plan to pursue green energy sources for operation of a brackish desalination facility.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, redrill wells, and pay for additional electricity for pumping.

Given the low permeability of the Trinity Aquifer within Travis County, additional studies will be needed to determine the impacts of the proposed extraction location on the surrounding groundwater table.

5.2.3.2.7. Centralized Direct Non-Potable Reuse

The Austin reclaimed water program is also referred to as Austin's Water Reclamation Initiative. This direct reuse program includes continued development of water distribution systems to provide reclaimed water to meet non-potable water demands within the Austin water service area. Austin has established its Central Reclaimed Water System from the Walnut Creek Wastewater Treatment Plant (WWTP) and its South system from the South Austin Regional WWTP. Through Water Forward, Austin's integrated water resource plan, Austin is also implementing decentralized reuse strategies, which are included in the Region K plan as a separate water management strategy. Austin projects that it will need to develop the use of reclaimed water to the maximum extent possible, up to and if necessary, 100 percent reuse of its effluent to meet future needs. As the level of authorized reclaimed water use in the Austin water service area increases, the amount of flow it returns to the Colorado River may decrease accordingly.

Austin is currently using reclaimed water from its existing reclaimed system to irrigate several golf courses, provide water for cooling towers, and meet other non-potable needs. Austin estimates this use to be approximately 4,600 ac-ft/yr. In order to expand the availability and use of reclaimed water, Austin has completed a series of planning activities, including the 2018 Water Forward Plan. In addition, Austin completed the publication of the 1998 Water Reclamation Initiative (WRI) Planning Document, completion of the north and south system master plans, and a Title XVI federal cost-share program feasibility study in conjunction with the Federal Bureau of Reclamation (FBR).

In addition to the water conservation measures Austin has implemented to reduce water demands, Austin is pursuing the development of reclaimed water as an additional supply of water to meet non-potable demands in the area. To meet the total projected water demands, the Water Reclamation Initiative would need to supply up to an additional 23,250 ac-ft/yr for direct municipal and manufacturing, and 1,750 ac-ft/yr for steam-electric non-potable purposes by the year 2070. The approximate total amount of this direct reuse supply in Travis County would be approximately 30,000 ac-ft/yr, which includes approximately 4,600 ac-ft/yr of existing direct reuse supply.

Austin anticipates that the use of reclaimed water will increase steadily from the current level of 4,600 ac-ft/yr with construction of additional major infrastructure components of the reclaimed system, including pump stations, storage, reclaimed water mains, and wastewater treatment plant filter and process improvements at multiple facilities. Austin will continue to pursue implementation of its WRI and anticipates that additional capacity will be available in the future as the needs increase over the planning horizon. *Table 5.58* shows the projected capacity increases for the three main categories of reuse for each decade of the planning period.

Table 5.58: Anticipated Centralized Reclaimed Water Capacity (Direct Reuse)

Year	2020	2030	2040	2050	2060	2070
Existing Direct Reuse Yield (ac-ft/yr)	4,600	4,600	4,600	4,600	4,600	4,600
Additional Municipal and Manufacturing Direct Reuse Yield (ac-ft/yr)	500	2,990	10,250	14,583	18,917	23,250
Additional Steam- Electric Direct Reuse Yield (ac-ft/yr)	0	1,750	1,750	1,750	1,750	1,750
Total Projected Direct Reuse Yield (ac-ft/yr)	5,100	9,340	16,600	20,930	25,270	29,600

Through its ongoing water resources planning efforts such as Water Forward, Austin Water evaluates its water reuse program and options for expansion. Future Region K plan updates will reflect changes as additional Austin water reclamation program information becomes available.

Projected Reduction of Return Flows

Austin recognizes that the water demand projections contained in the Lower Colorado Regional Water Plan are only projections. Actual water demands may increase faster or slower than projected. Austin will monitor the growth of its water demands and adjust its reclaimed water program, as well as its other water conservation programs, accordingly. As a result, Austin has indicated that it may increase the use of reclaimed water at a faster rate than projected in this plan. Austin believes that the increased use of reclaimed water will provide, in addition to the benefit of conserving sources of raw water, a monetary benefit to Austin through decreased raw water costs. As return flows discharged by Austin may diminish in the future due to increasing reclamation of water, other sources may need to be dedicated or developed to meet needs that may currently be met by return flows discharged by Austin.

Any decrease in municipal return flows will likely be gradual. However, Austin projects that it will increase its use of reclaimed water to the maximum extent feasible to meet demands above 325,000 ac-ft/yr, whether those demands occur before or after 2070.

Cost Implications of Proposed Strategy

In addition to water conservation, the use of reclaimed water has been identified as a significant source of water to meet Austin's projected demand deficits in 2070. Austin has completed planning studies, including the Water Forward Plan, for a centralized direct non-potable reuse to serve potential customers in Austin's service area. Centralized reuse will provide a portion of the water supply required to meet Austin's identified needs.

Costs for this strategy were developed based on background information provided by Austin Water, and the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

The following table shows the estimated costs associated with this strategy for the planning, design, and construction of the additional major infrastructure components of the reclaimed system, including pump stations, storage, reclaimed water mains, and wastewater treatment plant filter and process improvements at multiple facilities.

Table 5.59: Austin Centralized Direct Non-Potable Reuse Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$210,931,000	$286,031,000	$24,865,000	$995

Environmental Considerations

The water quality impacts from direct reuse of reclaimed water are regulated by the TCEQ through 30 TAC Chapter 210. Reclaimed water projects authorized under these regulations are presumed to be protective of human health and the environment. The potential impacts generated through the construction of the proposed pipelines and pump stations will need to be addressed in the preliminary engineering studies to be conducted for these projects.

The use of reclaimed water presents an alternative for providing water for non-potable uses without the development of new water supplies for Austin for the planning period. The costs and environmental impacts of expanding Austin's current reuse system will have to be determined as more specific information, such as the locations of customers to be served, is identified. The extent of pipeline and other transmission facilities will have to be determined before specific environmental impacts can be estimated. However, the majority of the facilities needed will most likely be placed in existing easements and, therefore, minimize the impact upon natural resources.

Table 5.60 shows the expected return flows from Austin after accounting for reuse and other demand reduction measures. Over the planning period, return flow amounts are projected to continue to be in the range of approximately 100,000 to 115,000 ac-ft/yr. The environmental impact analysis for this strategy compared the impact of return flows less the amount of reuse to the impact of no return flows for 2020 and 2070 scenarios. As would be expected, the impacts to instream flows and freshwater inflows to Matagorda Bay showed mainly flow increases.

Agricultural & Natural Resources Considerations

Impact to agriculture is negligible based on the projected return flow amounts over the planning period, as shown in *Table 5.60.*

Table 5.60: Projected Austin Return Flows by Decade*

2020	2030	2040	2050	2060	2070
108,978	114,129	102,440	102,121	99,557	100,935

*Based on data provided by Austin. These are projected return flow amounts after accounting for Austin's projected conservation, direct reuse, and other projects utilizing Austin's treated effluent. These projections are subject to change and are updated each planning cycle.

As allowed by state law and as contemplated by Austin and LCRA 2007 Settlement Agreement, Austin intends to use reclaimed water to the maximum extent feasible to meet demands above 325,000 ac-ft/yr, whether those demands occur before or after 2070. As a result, although current projections do not indicate that Austin will need to reuse all its effluent during this planning cycle, this strategy could result in Austin potentially reusing all its effluent to meet growing demands and, ultimately, Austin could have zero return flow to the Colorado River from its wastewater treatment plants (WWTP).

5.2.3.2.8. Decentralized Direct Non-Potable Reuse

The Decentralized Direct Non-Potable Reuse strategy proposes to treat and reuse wastewater in close proximity to the source of wastewater production. Smaller wastewater treatment plants are used to treat the wastewater to non-potable quality. End-uses of reused water include toilet flushing; cooling water; and irrigation not in the Critical Water Quality Zone, floodplain, or the Edwards Aquifer Recharge Zone. Austin has developed the methods listed below for decentralized direct non-potable reuse.

Distributed Wastewater Reuse

Distributed Wastewater Reuse is defined by the COA as the collection of wastewater from the sewage system of new developments, treatment to non-potable quality, and reuse at the local/community scale. Capital required for this method includes a small-scale treatment plant, balancing storage, transfer pump and piping, and distribution piping.

Sewer Mining (Wastewater Scalping)

Sewer mining is defined by the COA as the extraction of wastewater from the existing centralized wastewater collection system, treatment to non-potable quality, and reuse at the local/community scale for new or existing developments. Capital required for this method includes extraction (riser and pump from sewer main), small-scale treatment plant, balancing storage, transfer pump and piping, and distribution piping.

This strategy is expected to provide approximately 16,680 ac-ft/yr by 2070, as shown in the table below. Water availability is dependent on wastewater flows from the system area, storage capacities of the proposed system, and proposed end uses for non-potable water. While conservation efforts may decrease wastewater flows over time, wastewater flows are a relatively consistent and predictable source water, in comparison to rain or surface water. Per the Austin Water Forward Plan, the strategy is expected to be online by 2030.

Table 5.61: Austin Decentralized Direct Non-Potable Reuse Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	1,400	4,160	8,330	12,510	16,680

Cost Implications of Proposed Strategy

Estimates for capital and O&M costs were provided by Austin Water, not including engineering, legal, or contingency costs. These costs are approximately $9.5 million in facilities cost and $12.3 million of O&M costs in 2070. However, the pipeline and pump station infrastructure for this strategy is considered distribution system-level and is not allowed to be included in the costing, per regional water planning guidelines. Only treatment and storage costs have been included per regional water planning guidelines. In order to provide a comparable cost consistent with other strategies in this report, engineering, legal, and contingency costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars.

The following table shows the estimated costs associated with this strategy that are allowed under regional water planning guidelines.

Table 5.62: Austin Decentralized Direct Non-Potable Reuse Operations Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$4,189,000	$5,811,000	$803,000	$48

Environmental Considerations

Assuming the proposed local wastewater plants incur a small footprint, this strategy provides environmental benefit by reducing the energy spent transmitting wastewater from far reaches of the collection system to existing centralized wastewater treatment plants.

No outdoor end uses for this strategy are proposed for sensitive recharge areas, including the Edwards Aquifer Recharge Zone.

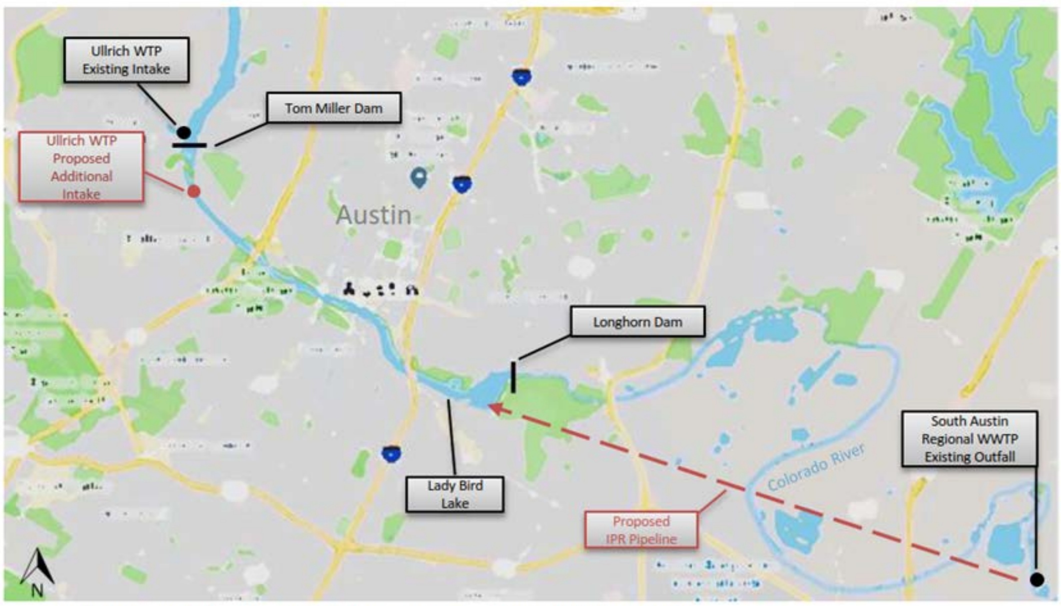
Agricultural & Natural Resources Considerations

Impact to agriculture is negligible based on the projected return flow amounts over the planning period.

5.2.3.2.9. Capture Local Inflows to Lady Bird Lake

This strategy for Austin involves capturing spring flows, including Barton Springs, and stormwater flows in Lady Bird Lake when they are not needed for downstream senior water rights including LCRA's Water Management Plan. This strategy facilitates the diversion of the city's run-of-river water during wetter periods and would plan to use the infrastructure installed as part of the Austin Indirect Potable Reuse through Lady Bird Lake strategy to convey water from Lady Bird Lake (LBL) to the intake at Ullrich Water Treatment Plant, as shown in *Figure 5-1*.

Figure 5.1: Capture Local Inflows to Lady Bird Lake and Indirect Potable Reuse through Lady Bird Lake Project



Note: figure is schematic and conceptual. Precise location of proposed infrastructure will vary.

This strategy is expected to provide an average of 3,000 acre-feet per year under drought conditions, once implemented, as shown in the following table. Water availability for the Capture Local Inflows to Lady Bird Lake option would generally be intermittent and seasonal, with availability more likely in the months of November through February when downstream agricultural irrigation operations are offline. Per the Austin Water Forward Plan, the strategy is expected to be online by 2040.

Table 5.63: Austin Capture Local Inflows to Lady Bird Lake Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	0	3,000	3,000	3,000	3,000

Cost Implications of Proposed Strategy

The capital costs for the infrastructure required to convey the water captured in Lady Bird Lake to the Ullrich Water Treatment Plant are included in the Austin Indirect Potable Reuse through Lady Bird Lake strategy and are not included as part of this strategy. The annual and unit costs for operation and maintenance for this strategy are based on scaled O&M costs for 3,000 ac-ft from the Indirect Potable Reuse through Lady Bird Lake strategy, which was based on the Austin Water Forward plan, dated 2018.

The following table shows the estimated annual and unit costs.

Table 5.64: Austin Capture Local Inflows to Lady Bird Lake Cost

Total Facilities Cost[1]	Total Project Cost[1]	Largest Annual Cost	Unit Cost ($/ac-ft)
$0	$0	$994,000	$331

[1] Infrastructure and costs are included in Indirect Potable Reuse through Lady Bird Lake.

Environmental Considerations

This strategy involves capturing spring flows, including Barton Springs, and stormwater flows in Lady Bird Lake when they are not needed for downstream senior water rights including LCRA's Water Management Plan. Diversions are anticipated to generally be conducted during wetter periods when water is typically available to other users in the basin. Therefore, this strategy is anticipated to have negligible effects on downstream flows in the Colorado River and estuary flows to Matagorda Bay. There is not an additional water right permit anticipated to be required for this strategy.

Agricultural & Natural Resources Considerations

Impacts to agriculture or natural resources are not expected.

5.2.3.2.10. Indirect Potable Reuse through Lady Bird Lake

Austin is proposing Indirect Potable Reuse through Lady Bird Lake as a strategy. The strategy would consist of conveying a highly treated portion of the South Austin Regional Wastewater Treatment Plant discharge to Lady Bird Lake via a reclaimed water transmission main. Water would be withdrawn from Lady Bird Lake with an intake pump station and pumped into the Ullrich Water Treatment Plant intake line. The infrastructure associated with pulling the water from Lady Bird Lake for treatment at Ullrich Water Treatment Plant could also be used with the Capture Local Inflows to Lady Bird Lake strategy for Austin to provide a smaller amount of water more regularly under wetter conditions outside a drought, as shown in *Figure 5.1* in *Section 5.2.3.2.9*.

The Austin Water Forward Plan recommends that this strategy be utilized only when Highland Lakes storage volumes are well below emergency levels. Therefore, this option is only being considered at this time as a source of supply under certain extreme drought conditions.

The Austin Water Forward Plan estimates that this strategy will be online by 2040, with yields up to 20,000 ac-ft/yr by 2070, as shown in the table below.

Table 5.65: Austin Indirect Potable Reuse through Lady Bird Lake Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	0	11,000	14,000	17,000	20,000

The major infrastructure required for this strategy includes:

- Acceleration of construction of reclaimed water lines identified in Austin's Reclaimed Master Plan
- Water Intake and Pump Station
- Transmission piping and appurtenances
- Improvements at South Austin Regional Wastewater Treatment Plant for a portion of the effluent to have additional treatment before discharge into Lady Bird Lake

As part of developing the indirect potable reuse strategy, a number of permitting and engineering analyses will need to be conducted. Project components to be addressed include water quality modeling, TCEQ permitting, and public education.

Cost Implications of Proposed Strategy

Capital and O&M cost estimates were provided by Austin Water. In order to provide a comparable cost consistent with other strategies in this report, annual costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars.

Note that the costs associated with the reclaimed water main that will transfer water from South Austin Regional Wastewater Treatment Plant to Lady Bird Lake are not included in the total capital costs for this strategy but are instead included in the costs associated with the Austin Centralized Direct Non-Potable Reuse strategy.

The following table shows the estimated costs associated with this strategy.

Table 5.66: Austin Indirect Potable Reuse through Lady Bird Lake Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$23,409,000	$35,839,000	$9,147,000	$457

Environmental Considerations

As stated previously, increased level of treatment of wastewater may be required to ensure sufficient water quality in Lady Bird Lake. Additional investigation will be required to evaluate environmental and water quality considerations and permitting in Lady Bird Lake.

This strategy helps satisfy a component of Austin demands already anticipated to be met through Colorado River diversions, particularly during drought and low reservoir storage volume conditions in lakes Travis and Buchanan.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Impact to agriculture is negligible based on the projected return flow amounts over the planning period.

5.2.3.2.11. Longhorn Dam Operations Improvements

This storage efficiency strategy consists of making improvements to Longhorn Dam. Longhorn Dam can release water through its vertical lift gates, knife gates, and bascule gates. The bascule gates are used as the primary source for the releases for water from the dam.

Austin currently has projects in its CIP for improvements to Longhorn Dam that would help increase the dam's storage efficiency. Among other components, these projects include security upgrades, electrical updates, gate improvements, and data acquisition and monitoring improvements. Cumulatively, these projects are expected to deliver approximately 3,000 ac-ft/yr of water savings, as shown in the following table.

Table 5.67: Austin Longhorn Dam Operations Improvement Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
0	3,000	3,000	3,000	3,000	3,000

Cost Implications of Proposed Strategy

Costs for this strategy were developed based on background information provided by Austin and the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

The capital cost for this strategy is primarily driven by the improvements to the gates. The following table shows the estimated costs associated with this strategy.

Table 5.68: Austin Longhorn Dam Operations Improvement Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$10,965,000	$15,211,000	$1,180,000	$393

Environmental Considerations

This strategy provides efficiencies that reduce unintended releases of water downstream in excess of environmental flow (instream flows) requirements, saving an estimated amount of up to 3,000 ac-ft/yr. LCRA manages the river system to meet downstream environmental flow needs and is ultimately responsible for ensuring instream flows requirements are being met. These requirements can be found in the LCRA Water Management Plan.

Agricultural & Natural Resources Considerations

Negligible impacts to agriculture or natural resources are expected as a result of implementing this strategy.

5.2.3.2.12. Lake Austin Operations

Lake Austin is normally operated as a pass-through lake with relatively stable lake levels. This strategy would allow Lake Austin to operate with a varying level in the event that combined storage in lakes Travis and Buchanan drops below 600,000 ac-ft, as included in the Austin Water Forward Plan. This would allow local flows to be captured during storm events and stored for use, as opposed to excess runoff spilling through the Tom Miller Dam to flow downstream. The level could vary by approximately 3 feet during months outside of the peak recreational period for Lake Austin. The period for operating with a variable level would potentially be in the months of October through May.

There are no capital costs and no new permits associated with this strategy, and it could be implemented fairly quickly. However, potential stored water benefits would only be available when rainfall and lake level conditions allow. Austin plans to conduct a robust public outreach and education process in advance of possible implementation of this strategy.

The projected yields from this strategy are shown in the following table.

Table 5.69: Austin Lake Austin Operations Yield

Water Management Strategies (ac-ft/yr)					
2020	**2030**	**2040**	**2050**	**2060**	**2070**
2,500	2,500	2,500	2,500	2,500	2,500

Cost Implications of Proposed Strategy

Annual and unit costs were taken from the Austin Water Forward effort, dated 2018, and are shown in the table below. No construction or capital costs were assumed. The costs listed include potential costs for professional public outreach resources and water treatment O&M costs to implement this strategy.

Table 5.70: Austin Lake Austin Operations Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$0	$0	$545,000	$218

Environmental Considerations

Environmental impacts are expected to be negligible.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

Impacts on Other Water Resources in the State

Minimal impacts to downstream flows are expected as a result of implementing this strategy.

5.2.3.3 West Travis County Public Utility Agency

West Travis County Public Utility Agency (WTCPUA) provides water to both retail customers and wholesale customers in Hays and Travis counties. Water management strategies have been developed to meet their future needs and their customers' potential future needs. WTCPUA currently has a contract for water with LCRA, and the majority of their wholesale customers also have contracts for water from LCRA. WTCPUA provides the treatment and transport for the contracted water, thus infrastructure has been sized to handle future wholesale customer needs, but the water supply contracts themselves will be with LCRA. See *Section 5.2.3.1.4* for additional information on the LCRA contract amendments for wholesale customers of WTCPUA. Recommended strategies for WTCPUA are listed below, although the details for each strategy are provided in other sections of the chapter. The respective sections are provided.

- Municipal Conservation – See *Section 5.2.2.3* for additional details
- Municipal Drought Management - See *Section 5.2.4.9.1* for additional details
- Hays County Pipeline - See *Section 5.2.4.3.1* for additional details
- Direct Potable Reuse - See *Section 5.2.5.4.4* for additional details
- Direct Reuse (Non-Potable) - See *Section 5.2.5.5.8* for additional details

5.2.4 Regional Water Management Strategies

There are several water management strategies that apply to multiple WUG categories, applied throughout the region. These strategies are discussed in this regional water management section of the report. For strategies specific to a category of water use, (Municipal, Irrigation, Manufacturing, Mining, and Steam-Electric Power) refer to later sections of the report.

For municipal WUGs with shortages, water conservation was considered before these regional strategies, please refer to *Section 5.2.2.3*.

5.2.4.1 Expanded Local Use of Groundwater

This group of strategies includes WUGs with existing groundwater sources that may be seeking to expand the amount of groundwater they produce from that source or sources to meet their increasing needs. The general strategy is divided into sections by aquifer.

5.2.4.1.1. Carrizo-Wilcox Aquifer

This strategy would involve pumping additional groundwater from the Carrizo-Wilcox Aquifer, either using the WUG's existing wells or drilling additional wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water under the Modeled Available Groundwater (MAG). The Carrizo-Wilcox Aquifer in Bastrop County had little remaining water for strategies after supplies were allocated, so strategy volumes are limited.

Table 5.71 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped.

Table 5.71: Carrizo-Wilcox Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Aqua WSC	Bastrop	Brazos (to Colorado)	0	100	250	500	800	800
Bastrop County Total for Brazos River Basin			**0**	**100**	**250**	**500**	**800**	**800**
Aqua WSC	Bastrop	Colorado	0	200	100	50	0	0
Elgin	Bastrop	Colorado	0	0	0	0	50	50
Bastrop County Total for Colorado River Basin			**0**	**200**	**100**	**50**	**50**	**50**

This strategy was applied to the following WUGs in Bastrop County: Aqua WSC and Elgin. Elgin is located in both Bastrop and Travis Counties in Region K, and a portion of the strategy supplies for Elgin were allocated to the Travis County portion. While the need for Aqua WSC is located in the Colorado basin, this strategy supplies Aqua WSC with groundwater from the Brazos and Colorado basins. The needs for Aqua WSC are close to 20,000 ac-ft/yr by 2070 after conservation and drought management are implemented, and this strategy does not have the available groundwater volume to meet that need. An alternative version of this strategy was developed that does meet the full need of Aqua WSC through groundwater. It is included in *Section 5.3.2*.

Cost Implications of Proposed Strategy

Table 5.72 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For WUGs with a strategy yield of greater than 100 ac-ft/yr, yield is assumed to be acquired through the construction of new wells. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node. One mile of transmission piping to connect the wellfield to the distribution system was assumed. A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). Assumptions of well capacity and depth were made by reviewing historical well data for wells located in proximity to each WUG. Historical data was obtained using the Texas Water Development Board Groundwater Database's well search and water level search functions.

Aqua WSC is supplied by two river basins through this strategy, thus two separate well fields are assumed, one for each basin. The costs for each basin have been combined for this analysis.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

For WUGs with a strategy yield of less than or equal to 100 ac-ft/yr (Elgin), yield is assumed to be acquired through additional pumping from existing wells. For this WUG, only the increased annual energy cost was included in the unit cost for the strategy, with no capital expenditures. Assumptions for well capacity, depth, efficiency, elevation, and layout follow the methodology for new well construction listed above.

Table 5.72: Carrizo-Wilcox Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC	Bastrop	Brazos, Colorado	$6,460,000	$9,163,000	$801,000	$1,001
Elgin	Bastrop	Colorado	$0	$0	$4,000	$80

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent, and the disturbance from pipeline construction is temporary. Availability numbers were developed by the Lost Pines Groundwater Conservation District for this aquifer in Bastrop County, and they attempt to limit the groundwater use to the amount that can be replenished on an annual basis. If this is the case, then the impact on the environment should be low. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 240 feet by 2070, relative to January 2000 conditions. The Groundwater Conservation Districts will monitor the aquifer levels for any needed changes to the identified available volume.

Refer to *Chapter 1*, *Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.2. Edwards-BFZ Aquifer

This strategy would involve pumping additional groundwater from the Edwards-BFZ Aquifer using the WUGs' existing wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water.

Table 5.73 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Each of the two WUGs requested that this strategy be included, but the amount of remaining available groundwater was small, so the strategy volumes are small.

Table 5.73: Edwards-BFZ Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Pflugerville	Travis	Colorado	0	0	20	20	20	20
Sunset Valley	Travis	Colorado	0	0	50	50	50	50
Travis County Total for Colorado River Basin			**0**	**0**	**70**	**70**	**70**	**70**

This strategy was applied to the Pflugerville and Sunset Valley WUGs in Travis County in the Colorado Basin.

Cost Implications of Proposed Strategy

Table 5.74 presents a summary of the probable costs for each WUG utilizing this strategy. The cost components analyzed during cost estimation of this strategy include Annual Cost and Unit Cost.

Per Barton Springs/Edwards Aquifer GCD requirements, a $0.17 per 1,000 gallons (approximately $55.39/ac-ft) production fee was assumed.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. No new wells or distribution piping was assumed for this strategy; instead, yield is assumed to be acquired through additional pumping from existing wells. As such, only the increased annual energy cost was included in the unit cost for the strategy, with no capital costs assumed.

Table 5.74: Edwards-BFZ Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Pflugerville	Travis	Colorado	$0	$0	$1,000	$50
Sunset Valley	Travis	Colorado	$0	$0	$6,000	$120

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent, and the disturbance from pipeline construction is temporary. Water supply is within the MAG, so spring/streamflow should be maintained at 42 ac-ft/month and 49.7 ac-ft/month or higher, as dictated by the DFC for the Edwards-BFZ Aquifer for Travis County for GMA-8 and GMA-10, respectively, as described in *Chapter 3* of the 2021 Plan.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.3. Ellenburger-San Saba Aquifer

This strategy would involve pumping additional groundwater from the Ellenburger-San Saba Aquifer, either using the WUG's existing wells, drilling additional wells or in the case of Bertram, using a raw water intake. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water.

Table 5.75 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped.

Table 5.75: Ellenburger-San Saba Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Johnson City	Blanco	Colorado	0	100	100	100	100	100
Blanco County Total for Colorado River Basin			**0**	**100**	**100**	**100**	**100**	**100**
Bertram	Burnet	Colorado (to Brazos)	0	750	2,000	2,000	2,000	2,000
Mining	Burnet	Colorado	0	1,000	1,000	1,000	1,000	1,000
Burnet County Total for Colorado River Basin			**0**	**1,750**	**3,000**	**3,000**	**3,000**	**3,000**

This strategy was applied to the following WUGs: Johnson City in Blanco County, Mining in Burnet County, and Bertram in Burnet County.

Cost Implications of Proposed Strategy

Table 5.76 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool.

For new wells, a peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80 percent. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

Bertram provided details specific to their project that have been included in this analysis. The identified water source for the Bertram groundwater expansion project is the accumulated water that collects in an old quarry pit located approximately three miles south of the city of Burnet in the Colorado Basin. TCEQ has made the determination that the quarry is an off-channel reservoir and does not require any water right permits. Raw water (considered to be groundwater for regional water planning purposes) will be pumped from the existing pit/reservoir to an existing nearby ground storage tank. In addition, one or more groundwater wells would be drilled in the area to increase access. Infrastructure required for this project includes:

- ~1.8 MGD raw water intake from quarry pit/reservoir, assumed to be located 50 feet deep
- ~1.8 MGD rated capacity water treatment plant
- 7,470 linear feet of 16-inch transmission pipe
- One (1) contingency well

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. No land acquisition costs were assumed for Bertram as they own or lease the property the wells would be drilled on. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Johnson City has additional unused wells that can come online so costs were only included for additional energy requirements for this WUG.

Table 5.76: Ellenburger-San Saba Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Johnson City	Blanco	Colorado	$0	$0	$7,000	$70
Bertram	Burnet	Colorado (to Brazos)	$14,926,000	$20,829,000	$2,470,000	$1,235
Mining	Burnet	Colorado	$4,782,000	$7,097,000	$581,000	$581

Environmental Considerations

The environmental impacts of expanded groundwater use from the Ellenburger-San Saba Aquifer will vary depending upon site characteristics but are not expected to be significant. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent and the disturbance from pipeline construction is temporary. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to maintaining at least a 90% saturated thickness of the aquifer from 2010 to 2070, as described in *Chapter 3*. The Groundwater Conservation Districts will monitor the aquifer levels for any needed changes to the identified available volume.

Refer to *Chapter 1, Appendix 1A*, for the complete list by County of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The Ellenburger-San Saba is a source of water supply for agricultural interests in Burnet, Blanco, Gillespie, and Llano Counties. There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.4. Gulf Coast Aquifer

This strategy would involve pumping additional groundwater from the Gulf Coast Aquifer, either using the WUG's existing wells or drilling additional wells. This additional water, referred to as remaining supply, was determined by subtracting the water that is currently allocated from the available water. This strategy includes expanding groundwater for the Wharton Water User Group (WUG) in response to the Wharton Water Supply strategy, detailed in *Section 5.2.5.2.*

Table 5.77 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet each WUG's individual shortage.

Table 5.77: Gulf Coast Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	2,500	2,500	2,500	2,500	2,500	2,500
Colorado County Total for Brazos-Colorado River Basin			**2,500**	**2,500**	**2,500**	**2,500**	**2,500**	**2,500**
Corix Utilities Texas Inc.	Colorado	Colorado	0	0	0	1	2	4
County-Other	Colorado	Colorado	0	133	133	133	133	133
Irrigation	Colorado	Colorado	550	550	550	550	550	550
Colorado County Total for Colorado River Basin			**550**	**683**	**683**	**683**	**683**	**683**
Irrigation	Colorado	Lavaca	5,000	5,000	5,000	5,000	5,000	5,000
Colorado County Total for Lavaca River Basin			**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**
County-Other	Fayette	Lavaca	1	1	20	41	41	41
Fayette County Total for Lavaca River Basin			**1**	**1**	**20**	**41**	**41**	**41**
Bay City	Matagorda	Brazos-Colorado	0	75	75	75	75	75
Matagorda County Total for Brazos-Colorado River Basin			**0**	**75**	**75**	**75**	**75**	**75**
Irrigation	Matagorda	Colorado-Lavaca	300	300	300	300	300	300
Matagorda County Total for Colorado-Lavaca River Basin			**300**	**300**	**300**	**300**	**300**	**300**
Irrigation	Wharton	Brazos-Colorado	5,000	5,000	5,000	5,000	5,000	5,000
Wharton	Wharton	Brazos-Colorado	0	3,000	3,000	3,000	3,000	3,000
Wharton County Total for Brazos-Colorado River Basin			**5,000**	**8,000**	**8,000**	**8,000**	**8,000**	**8,000**
Irrigation	Wharton	Colorado	600	600	600	600	600	600
Wharton County Total for Colorado River Basin			**600**	**600**	**600**	**600**	**600**	**600**

Cost Implications of Proposed Strategy

Table 5.78 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For WUGs with a strategy yield of greater than 100 ac-ft/yr, yield is assumed to be acquired through the construction of new wells. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node. One mile of transmission piping to connect to the distribution system was assumed for municipal WUGs other than County-Other. A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). Assumptions of well capacity and depth were made by reviewing historical well data for wells located in proximity to each WUG. Historical data was obtained using the Texas Water Development Board Groundwater Database's well search and water level search functions.

Additional project costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

For WUGs with a strategy yield of less than or equal to 100 ac-ft/yr, yield is assumed to be acquired through additional pumping from existing wells. For these WUGs, only the increased annual energy cost was included in the unit cost for the strategy, with no capital expenditures. Assumptions for well capacity, depth, efficiency, elevation, and layout follow the methodology for new well construction listed above.

An annual production fee of $1/ac-ft was assumed for WUGs within the Fayette County GCD.

Table 5.78: Gulf Coast Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Colorado	Brazos-Colorado	$3,069,000	$4,482,000	$442,000	$177
Corix Utilities Texas Inc.	Colorado	Colorado	$0	$0	$198	$50
County-Other	Colorado	Colorado	$1,406,000	$2,003,000	$162,000	$1,218
Irrigation	Colorado	Colorado	$972,000	$1,424,000	$137,000	$249
Irrigation	Colorado	Lavaca	$6,019,000	$8,774,000	$853,000	$171
County-Other	Fayette	Lavaca	$0	$0	$2,000	$49
Bay City	Matagorda	Brazos-Colorado	$0	$0	$4,000	$53
Irrigation	Matagorda	Colorado-Lavaca	$985,000	$1,431,000	$129,000	$430
Irrigation	Wharton	Brazos-Colorado	$5,676,000	$8,325,000	$851,000	$170
Wharton	Wharton	Brazos-Colorado	$6,354,000	$9,100,000	$817,000	$272
Irrigation	Wharton	Colorado	$878,000	$1,293,000	$125,000	$208

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics but are not expected to be significant. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent and the disturbance from pipeline construction is temporary. No Gulf Coast Aquifer use is expected to surpass the current, available yield of the aquifers as determined in *Chapter 3* of the 2021 Region K Water Plan. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 13 feet by 2070, relative to January 2000 conditions.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

This strategy will help meet the needs of agricultural users in the region by providing additional groundwater supply to the irrigation WUGs listed in *Table 5.77*; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.5. Sparta Aquifer

This strategy would involve pumping additional groundwater, either via existing wells or by drilling additional wells. *Table 5.79* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water to be pumped. Additional groundwater was only allocated to meet the WUG's shortage.

Table 5.79: Sparta Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Fayette	Colorado	0	40	98	145	180	204
Fayette County Total for Colorado River Basin			**0**	**40**	**98**	**145**	**180**	**204**

This strategy was applied to the Fayette County-Other WUG, beginning in 2030.

Cost Implications of Proposed Strategy

Table 5.80 presents a summary of the probable costs for the WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Construction Cost, Total Capital Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategy were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For this strategy, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile “trunk” line connecting to the next node. One mile of transmission piping to connect the wellfield to the distribution system was assumed.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Per Fayette County GCD requirements, 20 acres of land acquisition and an annual production fee of $1/ac-ft was assumed.

Table 5.80: Sparta Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Fayette	Colorado	$1,674,000	$2,638,000	$230,000	$1,127

Environmental Impact

Water from this strategy is within the identified available groundwater from the aquifer. The impact on the environment from construction of wells and pipelines is expected to be low, with most of the impact occurring during the construction process itself.

The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 47 feet by 2070, relative to January 2000 conditions.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The Sparta Aquifer water is used for limited agricultural purposes in Fayette County and increased use of this source for municipal purposes is expected to have a negligible impact on agriculture; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.6. Trinity Aquifer

This strategy would involve pumping additional groundwater from a currently used source, either using their existing wells or drilling additional wells. *Table 5.81* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped.

Table 5.81: Trinity Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Hays	Colorado	0	0	0	0	0	200
Dripping Springs WSC	Hays	Colorado	0	0	300	300	300	300
Mining	Hays	Colorado	600	600	600	600	600	600
Colorado County Total for Colorado River Basin			**600**	**600**	**900**	**900**	**900**	**1,100**
Irrigation	Mills	Brazos	300	300	300	300	300	300
Mills County Total for Brazos River Basin			**300**	**300**	**300**	**300**	**300**	**300**
Garfield WSC	Travis	Colorado	0	0	0	7	26	47
Manville WSC	Travis	Colorado	0	0	0	0	0	703
Travis County Total for Colorado River Basin			0	**0**	**0**	**7**	**26**	**750**

This strategy was applied to County-Other, Dripping Springs WCS, and Mining in Hays County; Irrigation in Mills County; and Garfield WSC and Manville WSC in Travis County.

Cost Implications of Proposed Strategy

Table 5.82 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For WUGs with a strategy yield of greater than 100 ac-ft/yr, the yield is assumed to be acquired through the construction of new wells.

The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per “node,” a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile “trunk” line connecting to the next node. One mile of transmission piping to connect the wellfield to the distribution system was assumed for municipal WUGs. Mining and Irrigation uses are assumed to be onsite, and therefore a one-mile transmission line with pump station is not needed. A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). Assumptions of well capacity and depth were made by reviewing historical well data for wells located in proximity to each WUG. Historical data was obtained using the Texas Water Development Board Groundwater Database’s well search and water level search functions.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the TWDB Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

For WUGs with a strategy yield of less than or equal to 100 ac-ft/yr (Garfield WSC), the yield is assumed to be acquired through additional pumping from existing wells. For this WUG, only the increased annual energy cost was included in the unit cost for the strategy, with no capital expenditures. Assumptions for well capacity, depth, efficiency, elevation, and layout follow the methodology for new well construction listed above.

Table 5.82: Trinity Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Hays	Colorado	$1,803,000	$2,674,000	$236,000	$1,180
Dripping Springs WSC	Hays	Colorado	$2,371,000	$3,507,000	$307,000	$1,023
Mining	Hays	Colorado	$1,625,000	$2,409,000	$224,000	$373
Irrigation	Mills	Brazos	$883,000	$1,323,000	$121,000	$403
Garfield WSC	Travis	Colorado	$0	$0	$4,000	$85
Manville WSC	Travis	Colorado	$3,420,000	$5,035,000	$452,000	$643

Environmental Considerations

The impacts of construction of wells and pipelines, if properly managed, are expected to produce negligible impacts to the environment, and primarily during the construction period itself. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to the following maximum drawdowns by 2070, relative to January 2000 conditions: in Hays County (GMA 9), up to 30 feet; in Mills County, up to 13 feet, depending on the formation; in Travis County, up to 146 feet, depending on the formation.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

This strategy provides supply for irrigation in Mills County, which will have a positive impact on agriculture; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.1.7. Yegua-Jackson Aquifer

This strategy would involve pumping additional groundwater, either using their existing wells or by drilling additional wells. *Table 5.83* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water to be pumped.

This strategy was applied to the Fayette Mining, Colorado Basin WUG. The water demand for this WUG decreases over time, so the water need no longer exists after the 2030 decade.

Table 5.83: Yegua-Jackson Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Fayette	Colorado	760	760	0	0	0	0
Fayette County Total for Colorado River Basin			**760**	**760**	**0**	**0**	**0**	**0**

Cost Implications of Proposed Strategy

Table 5.84 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node. The wellfield was assumed to be onsite and that no additional transmission piping was needed to reach the supply location.

Per Fayette County GCD requirements, 380 acres of land acquisition and a $1/ac-ft production fee was assumed.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.84: Yegua-Jackson Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Mining	Fayette	Colorado	$2,127,000	$5,463,000	$431,000	$567

Environmental Considerations

Water from this strategy is within the identified available groundwater from the aquifer. The impact on the environment from construction of wells and pipelines is expected to be low, with most of the impact occurring during the construction process itself.

The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 77 feet by 2070, relative to January 2010 conditions.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The Yegua-Jackson Aquifer is a source of water supply for agricultural interests in Fayette County. There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2 Development of New Groundwater Supplies

This group of strategies includes those WUGs that are obtaining groundwater from new groundwater sources which they have not tapped previously.

5.2.4.2.1. Ellenburger-San Saba Aquifer

This strategy would involve developing a new well field to pump water from the Ellenburger-San Saba Aquifer for WUGs that do not currently use the Ellenburger-San Saba Aquifer as a source of water. For Mining WUGs, it is assumed that the new wellfield will be constructed within the mining property and transmission from the wellfield to the site is not required. A new well field will consist of new wells and one-half mile segments of line between wells and nodes. *Table 5.85* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.85: Ellenburger-San Saba Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Burnet	Brazos	0	0	0	300	400	700
Burnet County Total for Brazos River Basin			**0**	**0**	**0**	**300**	**400**	**700**

This strategy was applied to the Mining WUG in Burnet County in the Brazos Basin.

Cost Implications of Proposed Strategy

Table 5.86 presents a summary of the probable costs for the WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.86: Ellenburger-San Saba Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Mining	Burnet	Brazos	$3,119,000	$4,495,000	$374,000	$534

Environmental Considerations

The additional pumping from the Ellenburger-San Saba Aquifer is within the available yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. The water supply is within the Modeled Available Groundwater (MAG), which allows for a potential reduction of the saturated thickness of the aquifer by 10% from 2010 to 2070, as described in *Chapter 3*.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The Ellenburger-San Saba is a source of water supply for agricultural interests in Burnet, Blanco, Gillespie, and Llano Counties. There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2.2. Gulf Coast Aquifer

This strategy would involve developing a new well field to pump water from the Gulf Coast Aquifer for WUGs that do not currently use the Gulf Coast Aquifer as a source of water. For Irrigation WUGs, it is assumed that the new wellfield will be constructed near the irrigated acreage, and transmission from the wellfield to the field is not required. A new well field will consist of new wells, and one-half mile segments of line between wells and nodes. *Table 5.87* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.87: Gulf Coast Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Matagorda	Colorado	510	510	510	510	510	510
Matagorda County Total for Colorado River Basin			**510**	**510**	**510**	**510**	**510**	**510**

This strategy was applied to the Irrigation WUG in Matagorda County in the Colorado Basin.

Cost Implications of Proposed Strategy

Table 5.88 presents a summary of the probable costs for the WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per “node,” a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile “trunk” line connecting to the next node.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.88: Gulf Coast Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Irrigation	Matagorda	Colorado	$843,000	$1,195,000	$92,000	$180

Environmental Considerations

The impacts to the environment from the additional yield being sought from the Gulf Coast Aquifer are expected to be negligible. Impacts from construction of wells and pipelines should be limited primarily to the construction period. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 13 feet by 2070, relative to January 2000 conditions. This use of groundwater will provide additional return flows to the Colorado River and Matagorda Bay from agriculture.

Agricultural & Natural Resources Considerations

This strategy provides additional water supply for irrigation in Matagorda County, which benefits agriculture; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2.3. Hickory Aquifer

This strategy would involve developing a new well field to pump water from the Hickory Aquifer for WUGs that do not currently use the Hickory Aquifer as a source of water. For Mining WUGs, it is assumed that the new wellfield will be constructed within the mining property and transmission from the wellfield to the site is not required. A new well field will consist of new wells and one-half mile segments of line between wells and nodes. *Table 5.89* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.89: Hickory Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Burnet	Colorado	0	1,000	1,000	1,000	1,000	1,000
Burnet County Total for Colorado River Basin			**0**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**

This strategy was applied to the Mining WUG in Burnet County in the Colorado Basin.

Cost Implications of Proposed Strategy

Table 5.90 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.90: Hickory Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Mining	Burnet	Colorado	$3,431,000	$4,863,000	$432,000	$432

Environmental Considerations

The additional pumping from the Hickory Aquifer is within the available yield of the aquifer for all decades. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. The water supply is within the Modeled Available Groundwater (MAG), which allows for a potential reduction of the saturated thickness of the aquifer by 10% from 2010 to 2070.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The location of this proposed strategy currently has no irrigation wells, so no impact to agriculture is expected.

5.2.4.2.4. Marble Falls Aquifer

This strategy would involve developing a new well field to pump water from the Marble Falls Aquifer. For Mining WUGs, it is assumed that the new wellfield will be constructed within the mining property and transmission from the wellfield to the site is not required. A new well field will consist of new wells and one-half mile segments of line between wells and nodes. *Table 5.91* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.91: Marble Falls Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Burnet	Colorado	0	0	1,000	1,000	1,000	1,000
Burnet County Total for Colorado River Basin			**0**	**0**	**1,000**	**1,000**	**1,000**	**1,000**

This strategy was applied to the Mining WUG in Burnet County in the Colorado Basin.

Cost Implications of Proposed Strategy

Table 5.92 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.92: Marble Falls Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Mining	Burnet	Colorado	$2,346,000	3,345,000	$307,000	$307

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. The water supply is within the Modeled Available Groundwater (MAG), which allows for a potential reduction of the saturated thickness of the aquifer by 10% from 2010 to 2070, as described in *Chapter 3*.

Refer to *Chapter 1*, *Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2.5. Sparta Aquifer

This strategy would involve developing a new well field to pump water from the Sparta Aquifer. A new well field will consist of new wells and one-half mile segments of line between wells and nodes. *Table 5.93* presents the WUG that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.93: Sparta Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Fayette	Colorado (to Lavaca)	400	400	400	400	400	400
Fayette County Total for Colorado River Basin			**400**	**400**	**400**	**400**	**400**	**400**

Cost Implications of Proposed Strategy

Table 5.94 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per “node,” a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile “trunk” line connecting to the next node.

A 5-mile transmission pipeline was assumed. The transmission line was assumed to be one pipe, five miles long, with a diameter based on a velocity of 5 ft/s at peak flow.

Per Fayette County GCD requirements, 200 acres of land acquisition and a $1/ac-ft production fee was assumed. Additionally, treatment costs for the removal of iron and manganese are assumed for manufacturing and municipal WUGs developing new sources of groundwater.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.94: Sparta Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Fayette	Colorado (to Lavaca)	$3,266,000	$6,056,000	$677,000	$1,693

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. The construction of well sites and pipelines is anticipated to have a low environmental impact primarily during the construction period, if proper precautions are taken to avoid environmentally sensitive areas. The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 47 feet by 2070, relative to January 2000 conditions.

Agricultural & Natural Resources Considerations

The Sparta Aquifer water is used for limited agricultural purposes in Fayette County and increased use of this source for municipal purposes is expected to have a negligible impact on agriculture; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2.6. Trinity Aquifer

This strategy would involve developing a new well field to pump water from the Trinity Aquifer for WUGs that do not use the Trinity Aquifer as an existing source. A new well field will consist of acquisition of a site, new wells, 5 miles of transmission line, and one-half mile segments of line between wells and nodes. A new storage tank is also assumed for those WUGs with new supplies greater than 100 ac-ft/yr. *Table 5.95* presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.95: Trinity Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Hays	Hays	Colorado	0	100	100	100	100	100
Hays County Total for Colorado River Basin			**0**	**100**	**100**	**100**	**100**	**100**
Elgin	Travis (to Bastrop)	Colorado	0	0	0	0	1,000	1,825
Sunset Valley	Travis	Colorado	0	0	300	300	300	300
Travis County MUD 10	Travis	Colorado	0	100	100	100	100	100
Travis County Total for Colorado River Basin			**0**	**100**	**400**	**400**	**1,400**	**2,225**

The portion of the Trinity Aquifer in Hays County that Hays would use is located within GMA 10. The portion of the Trinity Aquifer in Travis County that Elgin would use is located within GMA 8. The portion of the Trinity Aquifer in Travis County that Sunset Valley would use is located within GMA 10. The portion of the Trinity Aquifer in Travis County that Travis County MUD 10 would use is located within GMA 9.

Cost Implications of Proposed Strategy

Table 5.96 presents a summary of the probable costs for the WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) were provided.

A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per “node,” a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile “trunk” line connecting to the next node.

A 5-mile transmission pipeline was assumed with a pump station. The transmission line was assumed to be one pipe, five miles long, with a diameter based on a velocity of 5 ft/s at peak flow. Additionally, a new ground storage tank is assumed for all municipal WUGs with a strategy supply greater than 100 ac-ft/yr.

For WUGs in the Barton Springs/Edwards Aquifer GCD, a $0.17/1,000 gallons (approximately $55.39/ac-ft) production fee was assumed. Additionally, treatment costs for the removal of iron and manganese are assumed for manufacturing and municipal WUGs developing new sources of groundwater.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.96: Trinity Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Hays	Hays	Colorado	$2,492,000	$3,719,000	$383,000	$3,830
Elgin	Travis (to Bastrop)	Colorado	$10,225,000	$14,774,000	$1,740,000	$953
Sunset Valley	Travis	Colorado	$3,664,000	$5,401,000	$619,000	$2,063
Travis County MUD 10	Travis	Colorado	$2,492,000	$3,719,000	$383,000	$3,830

Environmental Considerations

The impacts of construction of wells and pipelines, if properly managed, are expected to produce negligible impacts to the environment, and primarily during the construction period itself.

The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to the following maximum drawdowns by 2070, relative to January 2000 conditions: in GMA 8 in Travis County, up to 146 feet, depending on the formation; in GMA 9 in Hays and Travis counties, up to 30 feet; in GMA 10 in Hays and Travis counties, up to 25 feet.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.2.7. Yegua-Jackson Aquifer

This strategy would involve developing a new well field to pump water from the Yegua-Jackson Aquifer. A new well field will consist of acquisition of a site, new wells, 5 miles of transmission line, one-half mile segments of line between wells and nodes, and will assume that the WUG has the available storage capacity to store this additional water.

Groundwater supplied to Smithville is assumed to be imported from Fayette County.

Table 5.97 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water needed.

Table 5.97: Yegua-Jackson Aquifer Development Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Manufacturing	Fayette	Lavaca	0	100	100	100	100	100
Fayette County Total for Lavaca River Basin			**0**	**100**	**100**	**100**	**100**	**100**
Smithville	Fayette (to Bastrop)	Colorado	0	700	700	700	700	700
Fayette County Total for Colorado River Basin			**0**	**700**	**700**	**700**	**700**	**700**

This strategy was applied to the Manufacturing WUG in Fayette County in the Lavaca Basin and to Smithville in Bastrop County in the Colorado Basin.

Cost Implications of Proposed Strategy

Table 5.98 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategies were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. For all these strategies, it was assumed that a new well field and transmission piping (interconnecting well piping) was provided.

A peaking factor of one (1) was assumed. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

A 5-mile transmission pipeline was assumed. The transmission line was assumed to be one pipe, five miles long, with a diameter based on a velocity of 5 ft/s at peak flow.

The following assumptions were made per Fayette County GCD requirements: one half acre of wellfield land acquisition per acre-foot of water supplied, a $1/ac-ft production fee, and a $0.025/1,000-gal ($8.15/ac-ft) export fee (where applicable). Additionally, treatment costs for the removal of iron and manganese are assumed for manufacturing and municipal WUGs developing new sources of groundwater.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.98: Yegua-Jackson Aquifer Development Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Manufacturing	Fayette	Lavaca	$2,178,000	$3,425,000	$358,000	$3,960
Smithville	Fayette (to Bastrop)	Colorado	$6,056,000	$13,421,000	$1,321,000	$1,887

Environmental Considerations

Water from this strategy is within the identified available groundwater from the aquifer. The impact on the environment from construction of wells and pipelines is expected to be low, with most of the impact occurring during the construction process itself.

The water supply is within the Modeled Available Groundwater (MAG), so this strategy could contribute to an overall drawdown in the aquifer of up to 77 feet by 2070, relative to January 2010 conditions. It is assumed that using water within the stated available yield should result in negligible impacts to springflows, but aquifer levels and springflows should be monitored.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

The Yegua-Jackson Aquifer is a source of water supply for agricultural interests in Fayette County. There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.2.4.3 Water Importation

The strategies discussed in this section bring water into Region K from outside of the region. These strategies have been requested for inclusion in both the Region K Plan and the South Central Texas (Region L) Plan. Coordination with Region L has occurred on the strategies in this section.

5.2.4.3.1. Hays County Pipeline

This strategy encompasses two regions, Region K and Region L. It involves bringing water from a delivery point near the Kyle area to Western Hays County. It is not itself a source of supply, but rather provides the infrastructure required to import potential water supplies from multiple areas around Central Texas. The supply will come from the Guadalupe-Blanco River Authority (GBRA) Mid-Basin (Phase 2) Project that develops water from the Guadalupe River and an Aquifer Storage and Recovery (ASR) in the Carrizo-Wilcox in Gonzales County in Region L and sends it through a transmission line to the Kyle area.

The Region L portion of this strategy includes a pipeline capable of conveying up to 15,000 ac-ft/yr from multiple potential sources to Wimberley. The Region K portion of this strategy would upsize this pipeline to allow conveyance of an additional 4,000 ac-ft/yr, or 19,000 ac-ft/yr total. It would also add an additional pipeline capable of conveying the 4,000 ac-ft/yr from a point to be determined between Kyle and Wimberley towards West Travis County PUA. For this strategy, the 4,000 ac-ft/yr of water is from the GBRA Mid-Basin (Phase 2) Project in Gonzales County.

The table below shows the projected use for only the Region K water user groups.

Table 5.99: Hays County Pipeline Yield for Region K

WUG	County	Basin	Importing From			Water Management Strategies (ac-ft/yr)					
			Region	County	Aquifer	2020	2030	2040	2050	2060	2070
County-Other	Hays	Colorado	L	Gonzales	GBRA Mid-Basin (Phase 2)	0	1,000	1,000	1,000	1,000	1,000
West Travis County PUA	Hays	Colorado	L	Gonzales	GBRA Mid-Basin (Phase 2)	0	3,000	3,000	3,000	3,000	3,000

Cost Implications of Proposed Strategy

The table below shows the estimated costs for this strategy. Only the additional costs required for the Region K portion of the strategy are shown. The Region L costs are shown in the separate 2021 South Central Texas Regional Water Plan. Costs from the 2016 Region K Water Plan were used, and five additional miles of piping length was added to extend past the 2016 Region K Water Plan destination of Dripping Springs. The infrastructure that the costs are based on include approximately 19 miles of 18" pipeline and the costs needed to upsize the Region L pipeline to carry the additional 4,000 ac-ft/yr until the Region K pipeline splits off. The updated 2016 Region K Water Plan costs were then converted to September 2018 costs, consistent with TWDB planning requirements. The total costs have been split proportionally between project participants. Costs also include annual raw water purchase from GBRA at $1,492/ac-ft, which is the unit cost of water from the GBRA Mid-Basin (Phase 2) Project.

Table 5.100: Hays County Pipeline Cost for Region K

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Hays	Colorado	$5,512,500	$7,485,500	$2,118,500	$2,119
West Travis County PUA	Hays	Colorado	$16,537,500	$22,456,500	$6,335,500	$2,119

Environmental Considerations

The environmental impacts of the construction should be able to be minimized as long as care is taken to avoid environmentally sensitive areas and provide proper restoration to the surface when complete.

Refer to the 2021 South Central Texas Regional Water Plan, Region L, for any impacts associated with the Region L portion of the strategy.

Refer to *Chapter 1, Appendix 1A,* for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Negligible impacts are anticipated on agriculture and natural resources. Refer to the 2021 South Central Texas Regional Water Plan for any impacts associated with the Region L portion of the strategy.

Other Impacts

In general, importing water from rural areas may affect rural users, as described in *Chapter 8* of the 2021 Plan.

5.2.4.3.2. Alliance Regional Water Authority Pipeline

This strategy involves the withdrawal and transport of groundwater from the Carrizo-Wilcox Aquifer in Gonzales County to the I-35 Corridor area near San Marcos, Kyle and Buda. This is primarily a Region L strategy, but a large portion of Buda is within Region K. The infrastructure required to implement this strategy includes:

- New well fields in Caldwell and Gonzales Counties.
- New treatment facilities near the new well fields.
- New pump stations and pipelines to convey the water to a delivery point near the Hays-Caldwell county line, approximately 5 miles northeast of San Marcos.

The following table lists the projected water use of this strategy.

Table 5.101: AWRA Pipeline Yield for Region K

WUG	County	Basin	Importing From			Water Management Strategies (ac-ft/yr)					
			Region	County	Aquifer	2020	2030	2040	2050	2060	2070
Buda	Hays	Colorado	L	Caldwell	Carrizo-Wilcox	0	762	1,829	1,829	2,113	2,113

Detailed information on this strategy, including Region L water user groups and yields, is included in the 2021 South Central Texas Regional Water Plan under the ARWA/GBRA Project.

Cost Implications of Proposed Strategy

The following table below describes the estimated costs for this strategy. The costs identified are Buda's portion of the overall ARWA project cost. Buda's portion of the ARWA costs is 5.08%.

Table 5.102: AWRA Pipeline Cost for Region K

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Buda	Hays	Colorado	$15,403,000	$21,965,000	$2,337,000	$1,106

More detailed cost information for this strategy is included in the 2021 South Central Texas Regional Water Plan under the ARWA/GBRA Project.

Environmental Considerations

There are several rare species that are in the vicinity of the project. Of these, the only one that is protected by USFWS or TPWD is the Cagle's map turtle.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

More detailed environmental considerations for this strategy are included in the 2021 South Central Texas Regional Water Plan under the ARWA/GBRA Project.

Agricultural & Natural Resources Considerations

Negligible impacts are anticipated on agriculture and natural resources; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

Other Impacts

In general, importing water from rural areas may affect rural users, as described in *Chapter 8* of the 2021 Plan.

5.2.4.4 *Aquifer Storage and Recovery*

5.2.4.4.1. BS/EACD –Edwards/Middle Trinity ASR

The basic definition of aquifer storage and recovery (ASR) is the storage of water in a suitable aquifer during times of excess water supply, and the recovery of the water from the same aquifer during times of greater water demand. Water is injected and removed from the aquifer through wells. ASR has the benefit of underground storage, so there is no evaporation, and dedicated storage tanks or reservoirs do not have to be built. There are also fewer environmental issues compared to surface storage because it does not change the surface of the land. This type of strategy is currently being used by cities in Texas including San Antonio, Kerrville, and El Paso.

For Hays, Hays County-Other, and Creedmoor-Maha WSC, the proposed source of water for this strategy is groundwater from the Edwards (Balcones Fault Zone, or BFZ) Aquifer in Hays County, although other sources could be used as well. For Buda, water sources include the Edwards-BFZ Aquifer as well as an existing GBRA surface water contract sourcing from Canyon Lake. Water would only be drawn from the Edwards-BFZ Aquifer for storage in the ASR during non-drought years, in months of low demand by water users who are permitted to withdraw from the Edwards-BFZ Aquifer.

The proposed storage aquifer for this strategy is the Middle Trinity Aquifer. This aquifer overlaps with the Edwards-BFZ Aquifer but is located at a greater depth; water will be pumped from the Edwards-BFZ Aquifer at a higher elevation to the Middle Trinity Aquifer at a lower elevation. The Middle Trinity Aquifer was selected as a storage aquifer because of its favorable hydrogeologic conditions which allow for water injection and a low rate of stored water migration. Additionally, the Middle Trinity Aquifer is located close to the source water and close to the distribution system, which is ideal for ASR.

At this time, the following WUGs have made progress towards or have been suggested as possible utilities for implementing this strategy: Buda, Creedmoor-Maha WSC, Hays, and Hays County-Other. Each WUG would implement their own ASR system with associated infrastructure.

At this time, one WUG has indicated interest and/or progress toward implementing this strategy. As of June 2019, Buda has completed a feasibility study for this strategy and allocated funds for a pilot test to begin in the fall of 2019, with facilities expected to be online in 2020. Strategy yield is expected to be 150 ac-ft/yr by 2020, with a full capacity of 600 ac-ft/yr reached by 2030.

The following infrastructure is required to implement the strategy for Buda:

- Existing wells should have capacity to extract the needed Edwards-BFZ Aquifer water, so no new extraction wells are assumed in the costing.
- New treatment facilities to treat the water to standards suitable for injection into the Middle Trinity Aquifer. A minimal level of treatment is assumed, with some mineral removal, as the extracted groundwater should be relatively clean.
- Four (4) new injection-extraction wells, each used to both inject and extract water to/from the Middle Trinity Aquifer. Since the Middle Trinity Aquifer overlaps with the Edwards aquifer, it is assumed that the wells extracting from Edwards and the wells injecting into Middle Trinity can be located in close proximity. Thus, no intermediate pump stations or pipelines are assumed.
- New transmission pump stations and pipelines to convey the water to the points of use. It is assumed that 1 mile of pipeline is sufficient to convey the water into the existing distribution system, for the various water users. Costs would be higher or lower, depending on actual distance.

For the remaining WUGs, the BS/EACD has available 2 cubic feet per second (1,448 ac-ft/yr) of freshwater from the Edwards-BFZ Aquifer for storage in ASR in a given year. Assuming 50% of years are non-drought years, total available withdrawal yield for these WUGs would be 724 ac-ft/yr. This strategy is expected to be online by 2030 and to provide the following yields to each WUG: 289 ac-ft/yr to Creedmoor-Maha WSC, 146 ac-ft/yr to Hays, and 289 ac-ft/yr to Hays County-Other. If other sources of water are identified for these WUGs, additional yield could be obtained from this strategy. Infrastructure required for each WUG's ASR project will include:

- Two (2) new extraction wells from the Edwards aquifer. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80% and a peaking factor of 2. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.
- New treatment facilities to treat the water to standards suitable for injection into the Middle Trinity Aquifer. A minimal level of treatment is assumed, with some mineral removal, as the extracted groundwater should be relatively clean.
- Two (2) new injection-extraction wells, each used to both inject and extract water to/from the Middle Trinity Aquifer. Since the Middle Trinity Aquifer overlaps with the Edwards aquifer, it is assumed that the wells extracting from Edwards and the wells injecting into Middle Trinity can be located in close proximity. Thus, no intermediate pump stations or pipelines are assumed.
- New transmission pump stations and pipelines to convey the water to the points of use. It is assumed that 1 mile of pipeline is sufficient to convey the water to the existing distribution system, for the various water users. Costs would be higher or lower, depending on actual distance.

Table 5.103 summarizes the yields by decade for this strategy.

Table 5.103: BS/EACD – Edwards/Middle Trinity ASR Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Buda	Hays	Colorado	150	600	600	600	600	600
Hays	Hays	Colorado	0	146	146	146	146	146
Hays County-Other	Hays	Colorado	0	289	289	289	289	289
Creedmoor-Maha WSC	Travis	Colorado	0	289	289	289	289	289

Cost Implications of Proposed Strategy

Costs for this strategy were developed based on background information provided by BS/EACD and Buda and were computed using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

If other sources of water other than the Edwards-BFZ Aquifer are identified for Hays, Hays County-Other, and Creedmoor-Maha WSC, strategy yields could be increased and unit costs reduced.

The table below shows the estimated costs for this strategy.

Table 5.104: BS/EACD – Edwards/Middle Trinity ASR Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Buda	Hays	Colorado	$5,235,000	$7,349,000	$839,000	$1,398
Hays	Hays	Colorado	$4,026,000	$5,673,000	$561,000	$3,842
Hays County-Other	Hays	Colorado	$4,235,000	$5,975,000	$633,000	$2,190
Creedmoor-Maha WSC	Travis	Colorado	$4,235,000	$5,975,000	$633,000	$2,190

Environmental Considerations

BS/EACD and TCEQ permits will be required to ensure the facility complies with all environmental considerations. This includes an aquifer study to determine the impact of the strategy on the proposed storage aquifer.

During average rainfall, the strategy may decrease springflow by removing up to an additional 1,324 ac-ft/yr for storage, within permitted amounts. Negligible impacts are expected during drought periods.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Negligible impacts to agriculture or natural resources are expected as a result of implementing this strategy. It is possible that agricultural users will benefit from increased water availability during times of drought, but this depends on whether there will be any agricultural users of this water source.

5.2.4.4.2. BS/EACD – Saline Edwards Desalination and ASR

The basic definition of aquifer storage and recovery (ASR) is the storage of water in a suitable aquifer during times of excess water supply, and the recovery of the water from the same aquifer during times of greater water demand. Water is injected and removed from the aquifer through wells. ASR has the benefit of underground storage, so there is no evaporation, and dedicated storage tanks or reservoirs do not have to be built. There are also fewer environmental issues compared to surface storage because it does not change the surface of the land. This type of strategy is currently being used by cities in Texas including San Antonio, Kerrville, and El Paso.

The water source for this strategy is brackish groundwater (8,000 mg/L TDS) from the saline Edwards-BFZ Aquifer. Water extracted from the saline Edwards-BFZ Aquifer will be desalinated prior to use or storage. The storage aquifer for this strategy is the saline portion of the Edwards-BFZ Aquifer. This portion of the aquifer is more suited for storage than the freshwater portion, as it has lower transmission rates and much higher residence times.

The ASR system will be operated as follows: in winter months, when consumer demands are low, a portion of the treated water will be pumped back into the aquifer for storage. In summer months, when consumer demands are high, the stored ASR water will be retrieved and distributed. This system allows for a reduced sizing of the treatment plant, as peak demands are mitigated through ASR.

The potential users identified to date for this water include Buda and rural users in Hays County.

While the 2018 Desalination/ASR feasibility report prepared for Barton Springs / Edwards Aquifer Conservation District sizes the project at 2.5 MGD (2,800 ac-ft/yr), for regional water planning purposes, the full amount of water is not available within the Modeled Available Groundwater (MAG) due to other projects in the 2021 Region K Plan. As a result, for regional water planning purposes, the sizing for this strategy has been limited to 1,300 ac-ft/yr. The infrastructure required to implement this strategy includes:

- Thee (3) extraction wells from the saline Edwards Aquifer. The extraction location is assumed to be the Texas Disposal Systems site in Creedmoor, TX. A peaking factor of one (1) was assumed for wells, given that ASR wells will supply water in order to mitigate peak demands. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5-mile "trunk" line connecting to the next node.
- Two (2) ASR injection-extraction wells to store/retrieve treated water in/from the saline Edwards aquifer. It is assumed that the ASR wells will be located 1 mile from the extraction wellfield, to prevent migration of stored ASR water. Therefore, 1 mile of transmission main and an associated pump station is assumed. Given the relatively short storage time (less than one year), minimal treatment via chlorine disinfection is assumed of ASR water upon extraction.
- ~1.2 MGD (1,300 ac-ft/yr) desalination treatment facility to treat water extracted from the saline Edwards-BFZ Aquifer. Source water is assumed to be brackish groundwater with a TDS of 8,000 mg/L. A reduced peaking factor was assumed because ASR wells will supply water in order to mitigate peak demands.
- Two (2) concentrate injection wells into the saline zone of the Edwards Aquifer. Concentrate injection is assumed to occur at a greater depth than the water extracted for treatment.
- New transmission pump stations and pipelines to convey the water to the points of use. It is assumed that 3 miles of pipeline is sufficient to convey the water to the existing distribution system, for the various water users.

Other requirements for this strategy include an aquifer study for the identified aquifer to determine feasibility and implementation requirements. The land required for the aquifer storage and recovery wells would also have to be purchased.

The yield from this strategy is projected to be 1,300 ac-ft/yr, including 800 ac-ft/yr for Buda and 500 ac-ft/yr for Hays County-Other. The water use for each is projected to start in the 2040 planning decade. The table below shows the projected yields by decade for this strategy.

Table 5.105: BS/EACD – Saline Edwards Desalination and ASR Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Buda	Hays	Colorado	0	0	800	800	800	800
County-Other	Hays	Colorado	0	0	500	500	500	500

Cost Implications of Proposed Strategy

Costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool based on background information provided by BS/EACD. Consistent with the tool, all costs are given in September 2018 dollars.

Per Barton Springs/Edwards Aquifer GCD requirements, a $0.08 per 1,000 gallons (approximately $26.07/ac-ft) fee was assumed for production from the Saline Edwards Management Zone.

There is the potential for reduced annual and unit costs for this strategy due to beneficial use of methane produced by an existing landfill located on-site. The energy produced from this methane could be used to power the desalination plant, pump station, and/or wells associated with this strategy. For the purposes of the 2021 Regional Water Plan, the costs for this strategy do not assume any reduction in power costs from this potential future power source, but future planning cycles could include this cost reduction.

The table below shows the estimated costs for this strategy.

Table 5.106: BS/EACD – Saline Edwards Desalination and ASR Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Buda	Hays	Colorado	$7,302,000	$10,332,000	$1,572,000	$1,951
County-Other	Hays	Colorado	$4,475,000	$6,332,000	$964,000	$1,951

Environmental Considerations

While environmental considerations for underground storage are less than that for surface storage, extensive permitting will still be required to ensure the facility complies with all environmental considerations. This includes an aquifer study to determine the impact of the strategy on the proposed storage aquifer. It also includes consideration of environmental impacts of disposal of the brine generated by the desalination treatment process.

The water supply for this strategy is within the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer of up to 75 feet by 2070, relative to January 2000 conditions.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Additionally, desalination facilities require greater energy demands, and thus produce more greenhouse gas emissions, in comparison to surface or groundwater facilities. While many studies demonstrate this water-energy relationship, the following list of energy requirements by water source type draw from the findings of the *EPRI Journal*, ("Water & Sustainability Volume 4," R. Goldstein et al, 2002) and the *International Journal of Environmental Science and Development* ("Energy Efficient Reverse Osmosis Desalination," R. Dashtpour et al, 2012):

- Fresh surface water: 1,406 kWh, or 994 kg CO_2eq, per MG water treated
- Fresh groundwater: 1,834 kWh, or 1290 kg CO_2eq, per MG water treated
- Desalination by reverse osmosis: 11,355 kWh, or 8030 kg CO_2eq, per MG water treated

Thus, even the most energy-efficient desalination processes produce approximately six to eight times as many greenhouse gas emissions, as compared to fresh and groundwater sources. There is the potential for reduced annual and unit costs for this strategy due to beneficial use of methane produced by an existing landfill located on-site. The energy produced from this methane could be used to power the desalination plant, pump station, and/or wells associated with this strategy.

Agricultural & Natural Resources Considerations

Negligible impacts to agriculture or natural resources are expected as a result of implementing this strategy. It is possible that agricultural users will benefit from increased water availability during times of drought, but this depends on whether there will be any agricultural users of this water source.

5.2.4.5 Burnet County Regional Projects

5.2.4.5.1. Buena Vista[5]

The Buena Vista Regional Project would serve Burnet and the Cassie and Buena Vista subdivisions (County-Other) in Burnet County, along with potential other small communities falling under County-Other. The following table shows the yields for this strategy.

Table 5.107: Buena Vista Regional Project Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Burnet	Burnet	Colorado	0	1,000	2,000	2,000	2,000	2,000
County-Other	Burnet	Brazos	0	500	1,000	1,000	1,000	1,000
County-Other	Burnet	Colorado	0	565	1,884	1,884	1,884	1,884

A portion of County-Other is located in the Brazos River basin, and because the water supplied by the Buena Vista Regional Project is coming from Lake Buchanan in the Colorado River basin, the project will require an interbasin transfer permit (IBT) under Texas Water Code 11.085. However, many provisions of 11.085, including 11.085(k), which requires an analysis of the water needs in the basin of origin and the receiving basin, will not apply to an IBT permit for this project. TWC 11.085(v)(4) stipulates that projects transferring water from one river basin to another, but within a single county, must obtain authorization for the interbasin transfer, but that only TWC 11.085(a) applies. Because County-Other is in Burnet County, which is also the location of the water supply, the exemption provided by TWC 11.085(v)(4) applies.

For the proposed Buena Vista Regional Project, Burnet's existing raw water intake (RWI), water treatment plant (WTP), and 18-inch transmission main would remain in place and serve as the core of the regional water system. The RWI, WTP and associated high service pump station (HSPS) firm capacities would all be expanded to 5,130 ac-ft/yr (4.58 MGD) to meet the added demand of the other entities. Over time, the RWI, WTP, and HSPS will each be expanded incrementally, reaching an ultimate firm capacity of 9,766 ac-ft/yr (8.72 MGD) in the year 2040. This includes a peaking factor of two on the yields shown in the table above.

[5] *Source: Roth, S. (2011). North Option 3: Burnet, Bertram, Buena Vista, and Cassie. In Burnet-Llano County Regional Facility Study (pp. 72-74).*

New transmission mains (8-inch for Buena Vista; 6-inch extension for Cassie) will be extended west and northwest from the WTP to serve the Buena Vista and Cassie Subdivision areas. Additionally, an 18-inch raw water pipeline will be installed alongside the existing 16-inch raw water line that runs from the RWI to the WTP. The flow within the existing 18-inch potable water transmission line would also need to be increased, requiring the construction of a 200,000-gallon ground storage tank and booster pump about 3.1 miles east of the existing WTP.

When the water demand exceeds the capacity provided by the 18-inch line, booster pump, and storage tank, a new 12-inch transmission main would be constructed along the route of the existing 18-inch transmission main from the WTP to the City of Burnet to supplement its capacity. The new transmission main would be tied into the intermediate storage tank and booster pump station.

Cost Implications of Proposed Strategy

Costs for this strategy were pulled from the *Burnet-Llano County Regional Facility Study* and updated using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

The table below shows the estimated costs for this strategy.

Table 5.108: Buena Vista Regional Project Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Burnet	Burnet	Colorado	$8,402,539	$11,828,829	$2,271,089	$1,136
County-Other	Burnet	Brazos	$4,201,269	$5,914,414	$1,135,545	$1,136
County-Other	Burnet	Colorado	$7,915,192	$11,142,757	$2,139,366	$1,136

Note that the annual costs include $145/ac-ft required for water purchase. The contracting portion of the strategy is included under the New LCRA Contracts with Infrastructure and LCRA Contract Amendments with Infrastructure strategy.

Environmental Considerations

This project covers several miles. This project could remove up to 5,000 ac-ft/yr of water from the Highland Lakes, with no return flows. Impacts from construction of intakes, treatment plants, and pipelines should be limited primarily to the construction period as long as care is taken to avoid environmentally sensitive areas and provide proper restoration to the surface when complete.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Impacts to agriculture should be relatively limited. Up to 5,000 ac-ft/yr would be removed from the Highland Lakes. As firm municipal and industrial demands increase in the future, less interruptible water will be available to meet downstream agriculture demands.

5.2.4.5.2. East Lake Buchanan[6]

A portion of the water user group (WUG) defined as County-Other in Burnet County currently receives their water from multiple groundwater sources. This water supply is unreliable and contaminated with radionuclides. To help alleviate concerns of water reliability and quality, Burnet County has proposed the East Lake Buchanan Project, a water supply system for the surrounding region. The project consists of replacing the existing groundwater sources with a new surface water supply. A new raw water intake would pump to a regional water treatment plant located near Bonanza Beach, along the northeast side of Lake Buchanan, as shown below in *Figure 5.2.* This location was chosen because it is a relatively undeveloped part of the lake's eastern shore that offers access to an even deeper part of the lake. A proposed high service pump station and transmission mains would deliver water south to Council Creek Village and north to the other participants in this area.

Figure 5.2: East Lake Buchanan Regional Project Location

The following table shows the yield for this strategy.

Table 5.109: East Lake Buchanan Regional Project Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Burnet	Colorado	0	498	935	935	935	935

Based on the LCRA Lake Buchanan bathometry map, the lowest contour near the proposed intake structure location is 950 ft-MSL, which is 33.7 feet below the historical low water surface elevation for the lake. The

[6] *Source: Roth, S. (2011). North Option 2A: NE Buchanan Regional Alternative (Intake near Bonanza Beach). In Burnet-Llano County Regional Facility Study (pp. 71-72).*

raw water intake and pump station are planned to have a firm capacity of 997 ac-ft/yr (0.89 MGD) by the year 2030. Both will subsequently be expanded to reach a capacity of 1,871 ac-ft/yr (1.67 MGD) by the year 2040 to meet increased demand in the area. This includes a peaking factor of two on the yield shown in the table above.

A 10-inch raw water pipeline will be used to transport pumped raw water from the intake to the water treatment plant. This 10-inch line will be sized to meet the demands of 1,871 ac-ft/yr expected for the year 2040. This includes a peaking factor of two on the yield shown in the table above.

A high service pump station will be constructed, initially with a capacity of 997 ac-ft/yr, at the water treatment plant to pump finished water from the water treatment plant to the regional transmission main and then to the participating distribution systems. This high service pump station will later be expanded to reach a capacity of 1,871 ac-ft/yr. This includes a peaking factor of two on the yield shown in the table above.

A 12-inch regional transmission main will be constructed east along an easement to FM 2341 at the southern edge of Council Creek Village. The 12-inch main will extend to the delivery point to Council Creek Village, where it would be reduced to a 10-inch transmission main extending northwest along FM 2341 to Bonanza Beach, South Silver Creek (I, II and III), and Burnet County MUD 2 with a branch to other northeast Lake Buchanan developments. An extension would provide treated water to Paradise Point via a 4-inch underwater crossing of Lake Buchanan. The regional transmission mains would deliver water to each participant's existing distribution system or into their existing water storage tanks. A 50,000-gallon regional storage tank is also recommended to maintain system pressure and improve pump operating conditions at the high service pump station.

Cost Implications of Proposed Strategy

Costs for this strategy were pulled from the Burnet-Llano County Regional Facility Study and updated using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars. The table below shows the estimated costs for this strategy.

Table 5.110: East Lake Buchanan Regional Project Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Burnet	Colorado	$8,306,000	$11,925,000	$1,830,000	$1,957

Note: The annual costs include $145/ac-ft required for water purchase. The contracting portion of the strategy is included under the New LCRA Contracts with Infrastructure strategy.

Environmental Considerations

This project covers several miles. This project could remove up to 935 ac-ft/yr of water from the Highland Lakes, with no return flows. Impacts from construction of intakes, treatment plants, and pipelines should be limited primarily to the construction period as long as care is taken to avoid environmentally sensitive areas and provide proper restoration to the surface when complete.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Impacts to agriculture should be minimal. Up to 935 ac-ft/yr would be removed from the Highland Lakes. As firm municipal and industrial demands increase in the future, less interruptible water will be available to meet downstream agriculture demands.

5.2.4.5.3. Marble Falls[7]

The Marble Falls Regional Water System would serve Marble Falls and County-Other entities, including Blanco San Miguel, Capstone Water System, and Windermere Oaks WSC, and potential others. This regional system has been proposed to address water reliability issues in several of these communities and to serve future development needs along Highway 281 and Highway 71. The system would also provide interconnects for either permanent or emergency water needs throughout the service area.

The following table shows the yields for this strategy.

Table 5.111: Marble Falls Regional Project Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Burnet	Colorado	0	1,578	1,578	1,578	1,578	1,578
Marble Falls	Burnet	Colorado	0	4,000	4,000	4,000	4,000	4,000

A new raw water intake (RWI) and pump station and WTP would be constructed upstream of Max Starcke Dam. A high service pump station (HSPS) would also be constructed at the WTP to pump finished potable water out into the transmission system. The regional plan also includes the incorporation of existing and addition of new transmission lines to serve the future County-Other Burnet community developments along Highways 71 and 281. Two new storage tanks (one ground, one elevated) and a booster pump station out in the transmission system are also planned.

An 18” main would need to be constructed that runs from the proposed WTP located at Max Starcke Dam to a new elevated storage tank (EST) and booster pump station located at Highway 71. At Highway 71, the main transitions into a 16” line that runs to a proposed ground storage tank (GST) at the Blanco/Burnet county line for water to serve Blanco San Miguel. Blanco San Miguel would be responsible for building their own pump station at the GST.

[7] *Source: Roth, S. (2011). South Option 2: Southeast Burnet County Regional System. In Burnet-Llano County Regional Facility Study (pp. 76-78).*

Additionally, a new 10” line would be built starting at the EST and booster pump station at Highway 71 and heading 2.6 miles southeast to Quail Creek and another 2.7 miles to the Spicewood Turnoff. At this point one 6-inch water transmission main would extend to Windermere Oaks WSC.

Cost Implications of Proposed Strategy

Costs for this strategy were pulled from the *Burnet-Llano County Regional Facility Study* and updated using the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars.

The table below shows the estimated costs for this strategy.

Table 5.112: Marble Falls Regional Project Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Burnet	Colorado	$11,426,800	$16,014,200	$2,266,000	$1,436
Marble Falls	Burnet	Colorado	$28,965,200	$40,593,800	$5,744,000	$1,436

Environmental Considerations

This project covers several miles. This project could remove up to 5,600 ac-ft/yr of water from the Highland Lakes, with no return flows. Impacts from construction of intakes, treatment plants, and pipelines should be limited primarily to the construction period as long as care is taken to avoid environmentally sensitive areas and provide proper restoration to the surface when complete.

Refer to *Chapter 1, Appendix 1A*, for the complete list by County of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Impacts to agriculture should be minimal. Up to 5,600 ac-ft/yr would be removed from the Highland Lakes. As firm municipal and industrial demands increase in the future, less interruptible water will be available to meet downstream agriculture demands.

5.2.4.6 Rainwater Harvesting

The implementation of rainwater harvesting as a water management strategy is dependent upon the catchment area, storage capacity, rainfall frequency, and water demand of the end user. During 2011, at the peak of the drought of record, Travis County received approximately 19 inches of rain and Hays County received approximately 18 inches of rain. This rainfall is not distributed uniformly during the year and, as a result, implementation of rainwater harvesting as a water management strategy should consider water demands and supplies over a multi-month period.

Typically, rooftops serve as the catchment area for rainwater harvesting systems, either from a single residence or a group of buildings. A catchment area of 2,000 square feet yields about 1,000 gallons for 1 inch of rainfall. The required storage capacity is a function of the rainfall frequency and water demand. As stated above, the variability of rainfall results in a need to consider sizing facilities to provide storage over a multi-month period in order to balance rainfall with water demand.

If rainwater harvesting is considered for non-potable, secondary uses, as opposed to being a primary water supply, the significance of storage is lessened, and the only remaining concern is the distribution system to deliver the water. This distribution system typically consists of a pump and pressure tank. However, some rainwater catchment systems are gravity driven, where pressurized systems may not be required.

If rainwater harvesting is considered as the primary potable water supply, additional considerations concerning filtration and disinfection must be considered. The filtration is readily available with cloth and carbon filtration units. The disinfection is readily available with either chemical or ultraviolet systems. Like the non-potable use, a distribution system is required and includes a pump and pressure tank.

For the purposes of planning, it was assumed that 10% of households (one catchment area per household) will implement large-scale rainwater harvesting starting in 2030. By this estimation, one household implementing rainwater harvesting will yield approximately 0.055 ac-ft, or 17,920 gallons, in a drought year. Assuming a catchment area of a house is about 2,000 square feet, the yield is estimated for drought of record rainfall conditions, shown in the following table.

Table 5.113: Rainwater Harvesting Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Hays	Colorado	0	16	24	31	36	50
Dripping Springs WSC	Hays	Colorado	0	34	44	57	73	81
Hays	Hays	Colorado	0	3	4	4	6	7
Sunset Valley	Travis	Colorado	0	2	2	3	3	4

Cost Implications of Proposed Strategy

The project costs – that is, full system costs and operations and maintenance costs – of rainwater harvesting systems are borne by individual system owners and are below the WUG level. As such, regional water planning guidelines do not allow these costs to be included in the regional water plans. It should be noted that WUGs may offset some of the costs of these systems through incentives.

While project costs for this strategy for regional water planning purposes are $0, the actual cost of a rainwater harvesting system is proportional to the water demand to be served by the system. It is assumed that a single-family household system consists of 15,000 gallons of storage, a pump and pressure tank, cloth filtration, carbon filtration, an ultraviolet disinfection system and miscellaneous piping. The capital cost for this system is about $11,500 for a system with a 30-year life. Replacement of mechanical equipment over the 30-year period has an anticipated cost of an additional $2,000.

Environmental and Agricultural Considerations

The benefit of rainfall harvesting is a decreased use of surface water or groundwater. Because of the close distance between the rainwater storage and the end use on the property, the gravity fed collection system, and the small footprints of storage tanks, there are no significant environmental or energy consumption impacts. Rainwater harvesting can additionally be beneficial from a stormwater management standpoint by reducing runoff during large storm events. Overall impacts to the environment and agriculture are expected to be negligible.

In some states, water right permits or authorizations are required for rainwater harvesting projects. Texas, however, does not require authorization for rainwater harvesting projects.

5.2.4.7 Water Purchase

This strategy acknowledges that certain WUGs in the region currently or may in the future purchase water from water providers other than LCRA. For those that currently purchase water from a provider, it is likely that these WUGs will purchase additional water as population and demands increase over time.

It should be noted that while several WUGs receive treat and transport services from West Travis County PUA, their contract for water is with LCRA, so strategies are included under LCRA contracts and contract amendments.

Table 5.114 lists the WUG that will implement this strategy as a new purchase, along with the volume of water needed and the entity supplying the water. *Table 5.115* lists the WUGs that will increase their existing contract, along with the volume of water needed and the entity supplying the water.

Table 5.114: New Water Purchase Suppliers and Yield

WUG	County	Basin	Supplier	Water Management Strategies (ac-ft/yr)					
				2020	2030	2040	2050	2060	2070
Hays	Hays	Colorado	Buda	0	0	0	0	70	140
Mining	Hays	Colorado	Buda (Reuse)	0	200	600	600	800	1,000
Windermere Utility	Travis	Colorado	Blue Water	0	500	500	500	500	500
Llano	Llano	Colorado	Burnet	177	0	0	0	0	0

Table 5.115: Water Purchase Amendment Suppliers and Yield

WUG	County	Basin	Supplier	Water Management Strategies (ac-ft/yr)					
				2020	2030	2040	2050	2060	2070
Barton Creek WSC	Travis	Colorado	Travis County MUD 4	90	90	90	90	90	90
Creedmoor-Maha WSC	Travis	Colorado	Aqua WSC	0	0	335	335	335	335
Travis County MUD 14	Travis	Colorado	Aqua WSC	0	0	0	35	35	35

Cost Implications of Proposed Strategy

The assumption used for this strategy is that the water is sold at retail cost, so there is no additional cost to the WUG, apart from Hays. Costs are based on the $/1,000-gallon cost currently charged by the water seller. For Hays to be able to purchase water from Buda, it is assumed that a one-mile pipeline would need to be built to connect the two systems.

Llano's water need is largely based on regional water planning WAM modeling assumptions regarding senior water right holders in the basin simultaneously diverting and totally consuming the water up to their full authorizations. Historically, Llano has had limited experience with running low on water, even for just a temporary basis. The Llano strategy for emergency water shortage conditions would be implemented by purchasing raw water from Burnet to be delivered by truck to the water treatment plant. As such, cost would depend on rates for hauling raw water and volumes to be transported. Llano provided a cost estimate consisting of an approximate 250,000 gallons per day, or 48 truckloads, supplied at $35,000/day. This strategy would not be feasible for Llano to implement long-term.

Table 5.116 identifies the facilities, project, annual, and unit costs associated with the water purchase strategies.

Table 5.116: New Water Purchase & Water Purchase Amendment Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Hays	Hays	Colorado	$134,000	$213,000	$215,000	$1,536
Mining	Hays	Colorado	$0	$0	$1,596,670	$1,597
Llano	Llano	Colorado	$0	$0	$8,074,588	$45,619
Barton Creek WSC	Travis	Colorado	$0	$0	$146,633	$1,629
Creedmoor-Maha WSC	Travis	Colorado	$0	$0	$409,350	$1,222
Travis County MUD 14	Travis	Colorado	$0	$0	$42,768	$1,222
Windermere	Travis	Colorado	$0	$0	$583,273	$1,167

Environmental Considerations

There are negligible environmental, agricultural, or natural resource impacts associated with this strategy. The impact of constructing the pipeline along an existing road should be low, with most of the impact occurring during the construction process itself.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

5.2.4.8 Brush Management

The following is a condensed version of the draft *Brush Control as a Water Management Strategy* prepared by HDR for Region G Planning Group and proposed for inclusion in Region K. Water supply yields and costs have been developed separately by Region K using a 2000 study of the Pedernales River/Lake Travis watershed.

Brush management is a potential water management strategy that could possibly create additional water supply in Texas. The Texas Brush Control Program, created in 1985 and operated by the Texas State Soil and Water Conservation Board (TSSWCB), served to study and implement brush control programs until September 2011. HB1808 established a new program in 2012, the Water Supply Enhancement Program (WSEP), with the purpose and intent of increasing available surface and ground water supplies through the selective control of brush species detrimental to water conservation. The program did not receive appropriations for the biennium beginning September 1, 2019, so any use of the program would require action by the legislature.

When the program has appropriations, the TSSWCB collaborates with soil water conservation districts and other local, regional, state, and federal agencies to identify watersheds across the state where it is feasible to implement brush control in order to enhance water supplies. The TSSWCB uses a competitive grant process to rank feasible projects and allocate WSEP grant funds, giving priority to projects that balance the most critical water conservation need of municipal water user groups with the highest projected water yield from brush management.

Brush management for water supply enhancement is addressed differently by the 16 Regional Water Planning Groups (RWPG). It typically is described as, alternatively, brush control, brush management, land stewardship, or range management. Brush management is a possible recommended or alternative Water Management Strategy which may have a quantified yield or a zero yield.

In prioritizing projects for funding, brush management for water supply enhancement must be viewed favorably by the RWPG where the proposed project is located. “Viewed favorably” is distinguished as a recommended or alternative Water Management Strategy or as a Policy Recommendation. Otherwise, the application is considered not to qualify for funding (State Water Supply Enhancement Plan, TSSWCB, July 2014).

Implementation

Brush Management is a land management practice that converts land that is covered with brush (such as juniper, mesquite, and saltcedar) to grasslands. The impact of these practices can increase water availability through reduced extraction of soil water for transpiration and increased recharge to shallow groundwater and emergent springs. To a lesser extent, there is the potential for increased runoff during rainfall events (Brush Control and Range Management: 2011 Brazos G Regional Water Plan).

Grazing management is very important following any type of upland brush control to allow the desirable forages to exert competition with the brush plants and to maintain good herbaceous groundcover, which hinders establishment of woody plant seedlings. Continued maintenance of brush is necessary to ensure the benefits of this potential strategy.

Target species are those noxious brush species that consume water to a degree that is detrimental to water conservation (i.e., phreatophytes).

Eligible Species:

- mesquite (Prosopis spp.)
- juniper (Juniperus spp.)
- saltcedar (Tamarix spp.)

Other species of interest conditionally eligible:

- huisache (Acacia smallii)
- Carrizo cane (Arundo donax)

The following methods of brush control are commonly practiced in Texas and have shown to have effective results.

Mechanical Brush Control

A wide variety of mechanical brush control methods are available. The simplest is selective brush control with a hand axe and chain saw. Grubbing and piling is frequently done with a bulldozer. This may be either clear-cut or selective.

Moderate to heavy mesquite or cedar can be grubbed (bulldozer with a 3-foot-wide grubbing attachment) or root plowed for $210 to $535/acre. Two-way chaining can be effective on moderate to heavy cedar, but it often just breaks off mesquite and they re- sprout profusely from the bud zones below ground. Using hydraulic shears mounted on Bobcat loaders can be effective on blueberry juniper (a non-sprouting species) for a cost of $85 to $175/acre. If the shears are used on mesquite or redberry juniper one must spray the stump immediately with an herbicide, which will cost in the range of $175/acre.

Chemical Brush Control

Several herbicides are approved for brush control and may be applied by aircraft, from booms on tractor-pulled spray rigs, or from hand tanks. Some herbicides are also available in pellet form.

Chemical treatments with Triclopyr (Remedy®) and Clopyralid methyl were shown to achieve about 70 percent root kill in studies around the state and in adjacent states. Generally, commercial aerial applications are not as effective, which is most likely due to fewer controls. Other herbicide treatments are available, but many will achieve little root kill. Aerial spraying of brush such as mesquite costs about $28 per acre and does not vary with plant density or canopy cover.

Brush Control by Prescribed Burning

Prescribed burning is defined as the application of fire to a predetermined area. The burn is conducted under prescribed conditions to achieve the desired effects. Prescribed burning allows for the control or suppression of undesirable vegetation to facilitate distribution of grazing and browsing animals, to improve forage production and/or quality, and to improve wildlife habitat.

Prescribed burning is estimated at $52/ac by EQIP payments. Actual costs will depend on how rocky the soils are and the amount of large brush to remove from the fire guards (i.e., a once-over pass with a maintainer versus clearing heavy brush with a bulldozer, then smoothing up the fire guard). Prescribed burning will only be effective under the right environmental conditions, and with an adequate amount of fine fuel (dead or dormant grasses). For successful burns, a pasture deferment is essential for part or all the growing season prior to burning and burned pastures must be rested after the burn. On average, a 12-month deferment is necessary, which may increase costs if a rancher cannot utilize the land for livestock grazing.

Burning rarely affects moderate to heavy stands of mature mesquite. Burning only topkills the smooth-bark of mesquite plants and they re-sprout profusely. For mesquite, fire only gives short-term suppression, and stimulates the development of heavier canopy cover than was present pre-burn. Burning is not usually an applicable tool in moderate to heavy cedar (juniper) because these stands suppress production of an adequate amount of grass for fine fuel. Burning can be excellent for controlling junipers over 4 feet tall, if done correctly. Prescribed burning is often not recommended for initial clearing of heavy brush due to the concern that the fire could become too hot and sterilize the soil. Burning is often used for maintenance of brush removal.

Bio-Control of Brush

Bio-control of salt cedar is a relatively new technique to be used in Texas. This control method has been studied for nearly 20 years and there have been pilot studies in the Lake Meredith watershed and most recently in the Colorado River Basin. Research has shown that the Asian leaf beetle can consume substantial quantities of salt cedar in a relatively short time period, and generally does not consume other plants. Different subspecies of the Asian beetle appear to be sensitive to varying climatic conditions, and there is on-going research on appropriate subspecies for Texas. It is recommended that this control method be integrated with chemical and mechanical removal to best control re-growth. The cost per acre is unknown.

Supply Attained by Brush Control

Although the actual supply benefit resulting from a brush management project is site specific, a 2000 study of the Pedernales River/Lake Travis watershed projected an average annual water yield increasing flows to Lake Travis by 57,050 ac-ft/yr. While average inflows into lakes Travis and Buchanan from 1942-2013 were 1,230,301 ac-ft (per USGS), the inflows during 2011 – the drought of record – were 127,802 ac-ft. Adjusted for drought of record conditions, brush management can increase drought-condition inflows to Lake Travis by 5,926 ac-ft/yr. This would be considered a benefit to LCRA and its customers.

While the above analysis focuses on increased runoff, there is also a local benefit to groundwater based on increased deep drainage. A study[8] documenting a water balance assessment on rangeland at the Texas Agriculture Experiment Station in Sonora, TX shows that removing juniper does not necessarily increase runoff because the soil under the cut brush maintains high infiltration rates after removal. The research indicated an increase in the deep drainage infiltration from 0 inches at 36% juniper to 0.3 inches at 18%

[8] Thurow, T. and Hester, J. "How an increase or reduction in juniper cover alters rangeland hydrology." Texas A&M University: Texas Natural Resources Server. 1997.

juniper, and up to 3.7 inches for complete juniper removal with 100% grass. 3.7 inches of deep drainage/yr is equal to 100,500 gallons/ac/yr.

If 40 percent of the brush removal acres contain juniper in quantities that can increase deep drainage by 0.3 inches per year, the additional benefit to local groundwater could be up to 2,000 ac-ft of water. Based on this projection, this yield has been allocated proportionally by geographic area to four counties in the Region K area.

This allocation is listed under County-Other, as shown in *Table 5.117*, and is assumed to be in effect by 2030. The 2017 State Water Supply Enhancement Plan mentions proposed feasibility for other areas in Region K, including the Barton Springs segment of the Edwards Aquifer (Barton and Onion Creeks), Lake Buchanan (including San Saba River, Brady Creek, and lower Pecan Bayou), and Lake LBJ, primarily Llano River below confluences of South and North Llano Rivers. Region K supports the funding of these feasibility studies but is not showing yields and costs for brush management strategies in those areas at this time. Region K acknowledges that brush management could be applied to other counties as well including, but not limited to, San Saba, Llano, Burnet, and Mills counties.

Table 5.117: Brush Management Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
County-Other	Blanco	Colorado	0	708	708	708	708	708
County-Other	Gillespie	Colorado	0	1,125	1,125	1,125	1,125	1,125
County-Other	Hays	Colorado	0	83	83	83	83	83
County-Other	Travis	Colorado	0	83	83	83	83	83

Cost Implications of Proposed Strategy

Brush management projects are site specific and costs can vary widely. For this strategy, costs were taken from the Pedernales/Lake Travis Watershed study and applied proportionally to the geographic area of the four counties. The average state cost share adjusted to September 2018 dollars was reported as $150.95/acre improved. Assuming the full 203,752 acres are improved, the facilities cost of the state's share totals $28,911,000. The state cost share is estimated as the difference between the present value of the total cost per acre of the control program and the present value of the benefits to the rancher. The costs to the state include only the cost for the state's cost share for brush control. Costs that are not accounted for, but which must be incurred, include costs for administering the program. Under current law, this task will be the responsibility of the Texas State Soil and Water Conservation Board. *Table 5.118* identifies the facilities, project, annual, and unit costs for the state associated with brush management in the region.

Table 5.118: Brush Management Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
County-Other	Blanco	Colorado	$10,240,000	$10,522,274	$842,646	$1,190
County-Other	Gillespie	Colorado	$16,261,000	$16,708,308	$1,338,037	$1,190
County-Other	Hays	Colorado	$1,205,000	$1,238,209	$99,158	$1,190
County-Other	Travis	Colorado	$1,205,000	$1,238,209	$99,158	$1,190

Environmental Considerations

The extent of brush management that may be desired by landowners will depend on how they plan to manage their land for wildlife and how the brush control will affect the value of the land for wildlife recreation purposes. In recent years, the value of ranch lands which have sufficient brush cover to support wildlife populations, particularly white-tailed deer, wild turkey, bobwhite, and scaled quail, has increased at a faster rate than the value of those lands which are void of brush or woody vegetation. Consequently, many landowners can be expected to support brush control to the extent that it does not exclude wildlife populations.

Other implementation issues for land owner participation include the perceived economic benefit of brush management. If the land is currently not actively managed for ranching or wildlife recreation the owner may choose not to participate. Decreased profitability of sheep, goat, and cattle grazing systems will influence the economics of brush control by ranchers, and consequently their willingness to participate. Also, the size of the land tracts can affect the total amount of brush removed and the effectiveness of a program. Watersheds that contain many small tracts are less likely to have the contiguous land owner participation that is needed to realize the water supply benefits associated with brush control.

On specific tracts where brush control would incorporate state or federal funding, regulatory compliance with the Texas Antiquities Code and National Historic Preservation Act may be required that may involve cultural resource surveys and incorporation of preservation measures. The Texas Commission on Environmental Quality has established regulations governing prescribed burning. There may also be local and county regulations associated with burning practices.

Implementation Issues

The extent of brush management that may be desired by landowners will depend on how they plan to manage their land for wildlife and how the brush control will affect the value of the land for wildlife recreation purposes. In recent years, the value of ranch lands which have sufficient brush cover to support wildlife populations, particularly white-tailed deer, wild turkey, bobwhite, and scaled quail, has increased at a faster rate than the value of those lands which are void of brush or woody vegetation. Consequently, many landowners can be expected to support brush control to the extent that it does not exclude wildlife populations.

Other implementation issues for land owner participation include the perceived economic benefit of brush management. If the land is currently not actively managed for ranching or wildlife recreation the owner may choose not to participate. Decreased profitability of sheep, goat, and cattle grazing systems will influence the economics of brush control by ranchers, and consequently their willingness to participate. Also, the size of the land tracts can affect the total amount of brush removed and the effectiveness of a program. Watersheds that contain many small tracts are less likely to have the contiguous land owner participation that is needed to realize the water supply benefits associated with brush control.

On specific tracts where brush control would incorporate state or federal funding, regulatory compliance with the Texas Antiquities Code and National Historic Preservation Act may be required that may involve cultural resource surveys and incorporation of preservation measures. The Texas Commission on Environmental Quality has established regulations governing prescribed burning. There may also be local and county regulations associated with burning practices.

5.2.4.9 Drought Management

Drought management is different from conservation in that conservation tends to look at the long-term and takes more permanent steps to reduce a community's GPCD slowly over time. Actions such as replacing old water fixtures with new low-flow fixtures, providing public education to the community about native vegetation that requires less water, and performing audits on waterlines to check for leaks are examples of conservation measures that, over time, can reduce the amount of water that a community needs. Drought management, on the other hand, attempts to reduce a community's GPCD by a larger amount over a shorter period of time. Both drought management and conservation can be important and effective in their own ways.

The GPCD numbers used in this plan are an annual average. The actual amount of water used is generally higher in the summer and lower in the winter, mainly due to outdoor watering in the warmer months. By restricting outdoor watering to once per week during the warmer months as a way of managing drought, the annual average GPCD for a community can be significantly lowered, depending on the level of restriction and the effort to provide the appropriate information to the public. Tiered water rates, which charge higher $/1,000-gallon rates once a customer uses more than a specified amount, have also been found to be effective in reducing water use.

5.2.4.9.1. Municipalities

Some municipal WUGs implemented mandatory water use restrictions during the summer of 2011. The Edwards-BFZ Aquifer in Hays County and Travis County – permitted by the BS/EACD – reached Critical Drought Stage, which required users to reduce water use by 30 percent. Austin restricted outdoor watering to one day per week. Both types of restrictions were effective in reducing water use. Austin showed that municipal WUGs that currently have their demands met (no shortage/need) can still be proactive by implementing drought management during times of reduced rainfall. Many other WUGs did not implement mandatory water restrictions until late in 2011 or early 2012. Thus, the water demand projections in the Region K Water Plan generally do not reflect implemented drought management water restrictions inherently. Based upon the restrictions implemented in recent years, it can be anticipated that in the future, during times of reduced rainfall comparable to 2011, water use restrictions would be implemented in a large portion of the region. Triggers associated with these recommended strategies include those referenced in the LCRA Water Management Plan and the individual municipal drought contingency plans (DCPs). The Palmer Drought Severity Index is another resource that could be used for determining triggers for these strategies.

- The methodology applied for the drought management strategy for municipal WUGs is as follows:
- GPCD greater than 100 – 20% water demand reduction each decade.
- GPCD less than or equal to 100 – 5% water demand reduction each decade.
- Defer to a WUG's DCP "Severe" trigger response goal when possible.
- Consider whether mandatory water use restrictions were in place in 2011.
- Consider levels of conservation that have been implemented since 2011.

For this planning cycle, drought management is recommended for most municipal WUGs regardless of need. The LCRWPG encourages municipal WUGs to follow their DCPs, as appropriate. For some WUGs that have drought management recommended as a strategy, the percent of water use reduction is as high as 30 percent per the "Severe" trigger goal as indicated in the WUG's respective DCP. *Table 5.119* below shows the municipal WUGs that would utilize this strategy along with the implementation decade and the amount of water saved.

Table 5.119: Municipal Drought Management Water Savings

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Aqua WSC	Bastrop	Brazos	17	23	30	39	52	69
Aqua WSC	Bastrop	Colorado	1,733	2,278	3,058	3,949	5,246	6,966
Aqua WSC	Bastrop	Guadalupe	12	16	21	28	37	49
Bastrop	Bastrop	Colorado	372	471	631	849	1,143	1,534
Bastrop County WCID 2	Bastrop	Colorado	24	35	49	68	94	129
County-Other	Bastrop	Brazos	2	2	2	2	3	4
County-Other	Bastrop	Colorado	250	274	322	386	474	591
County-Other	Bastrop	Guadalupe	6	7	8	10	12	15
Creedmoor-Maha WSC	Bastrop	Colorado	0	0	0	0	0	0
Elgin	Bastrop	Colorado	213	213	197	158	210	279
Lee County WSC	Bastrop	Brazos	7	8	9	11	15	19
Lee County WSC	Bastrop	Colorado	10	11	13	15	20	26
Polonia WSC	Bastrop	Colorado	3	4	4	5	6	8
Smithville	Bastrop	Colorado	150	198	259	343	456	606
Blanco	Blanco	Guadalupe	63	55	60	63	65	66
Canyon Lake Water Service	Blanco	Guadalupe	11	14	16	20	23	27
County-Other	Blanco	Colorado	70	65	59	56	54	54
County-Other	Blanco	Guadalupe	53	49	44	42	41	40

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Johnson City	Blanco	Colorado	64	77	84	87	90	91
Bertram	Burnet	Brazos	78	85	88	89	94	101
Burnet	Burnet	Brazos	1	1	1	1	2	2
Burnet	Burnet	Colorado	301	328	338	361	395	425
Corix Utilities Texas Inc	Burnet	Colorado	25	30	34	37	41	44
Cottonwood Shores	Burnet	Colorado	45	53	61	68	75	80
County-Other	Burnet	Brazos	246	273	273	300	325	348
County-Other	Burnet	Colorado	437	486	486	534	579	620
Georgetown	Burnet	Brazos	15	17	17	19	20	22
Granite Shoals	Burnet	Colorado	29	32	35	38	44	53
Horseshoe Bay	Burnet	Colorado	125	158	178	190	195	194
Kempner WSC	Burnet	Brazos	32	35	39	42	45	49
Kingsland WSC	Burnet	Colorado	2	3	3	3	4	4
Marble Falls	Burnet	Colorado	428	567	738	772	759	776
Meadowlakes	Burnet	Colorado	155	140	126	113	102	92
Columbus	Colorado	Colorado	206	194	180	169	157	146
Corix Utilities Texas Inc	Colorado	Colorado	9	9	9	9	9	10
County-Other	Colorado	Brazos-Colorado	18	14	11	10	10	10
County-Other	Colorado	Colorado	113	90	71	61	61	62
County-Other	Colorado	Lavaca	39	31	24	21	21	21
Eagle Lake	Colorado	Brazos-Colorado	30	26	24	22	23	23
Eagle Lake	Colorado	Colorado	68	60	54	51	52	54
Weimar	Colorado	Colorado	30	28	26	25	26	27
Weimar	Colorado	Lavaca	61	57	53	51	53	55
Aqua WSC	Fayette	Colorado	1	1	1	1	1	1
County-Other	Fayette	Colorado	124	116	106	102	104	107
County-Other	Fayette	Guadalupe	7	7	6	6	6	6
County-Other	Fayette	Lavaca	58	54	49	48	49	50

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Fayette County WCID Monument Hill	Fayette	Colorado	33	32	31	30	30	31
Fayette WSC	Fayette	Colorado	122	126	128	131	136	141
Fayette WSC	Fayette	Guadalupe	8	8	8	9	9	9
Fayette WSC	Fayette	Lavaca	14	15	15	15	16	16
Flatonia	Fayette	Guadalupe	12	12	12	13	14	14
Flatonia	Fayette	Lavaca	51	53	52	56	58	60
La Grange	Fayette	Colorado	174	196	213	226	237	245
Lee County WSC	Fayette	Colorado	25	24	23	22	23	23
Schulenburg	Fayette	Lavaca	128	131	128	130	136	141
West End WSC	Fayette	Colorado	7	7	8	8	9	10
County-Other	Gillespie	Colorado	144	105	90	95	100	105
County-Other	Gillespie	Guadalupe	6	4	4	4	4	4
Fredericksburg	Gillespie	Colorado	610	589	560	535	508	504
Austin	Hays	Colorado	9	38	59	94	137	198
Buda	Hays	Colorado	322	443	607	813	1,045	1,309
Cimarron Park Water	Hays	Colorado	18	12	12	11	11	11
County-Other	Hays	Colorado	158	103	132	155	176	243
Deer Creek Ranch Water	Hays	Colorado	1	1	2	2	2	2
Dripping Springs WSC	Hays	Colorado	351	580	753	972	1,239	1,380
Goforth SUD	Hays	Colorado	8	10	12	16	20	24
Hays	Hays	Colorado	37	47	59	70	87	107
Hays County WCID 1	Hays	Colorado	149	134	121	114	114	114
Hays County WCID 2	Hays	Colorado	52	61	70	76	95	117
West Travis County Public Utility Agency	Hays	Colorado	819	921	933	1,033	1,104	1,151
Corix Utilities Texas Inc	Llano	Colorado	37	37	37	37	37	37
County-Other	Llano	Colorado	13	10	11	11	10	9

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Horseshoe Bay	Llano	Colorado	516	482	423	386	342	301
Kingsland WSC	Llano	Colorado	46	52	51	48	52	57
Llano	Llano	Colorado	337	296	221	144	150	171
Sunrise Beach Village	Llano	Colorado	0	0	0	0	0	0
Bay City	Matagorda	Brazos-Colorado	582	593	596	605	614	621
Bay City	Matagorda	Colorado	1	1	1	1	1	1
Caney Creek MUD of Matagorda County	Matagorda	Brazos-Colorado	26	19	13	13	13	13
Corix Utilities Texas Inc	Matagorda	Brazos-Colorado	1	1	1	1	1	1
Corix Utilities Texas Inc	Matagorda	Colorado	0	0	0	0	0	0
County-Other	Matagorda	Brazos-Colorado	22	23	22	23	23	23
County-Other	Matagorda	Colorado	5	5	5	5	5	5
County-Other	Matagorda	Colorado-Lavaca	25	25	25	25	25	25
Markham MUD	Matagorda	Colorado-Lavaca	5	5	5	5	5	5
Matagorda County WCID 6	Matagorda	Brazos-Colorado	6	6	6	6	6	6
Matagorda Waste Disposal & WSC	Matagorda	Brazos-Colorado	9	9	9	10	10	10
Matagorda Waste Disposal & WSC	Matagorda	Colorado	14	14	14	14	15	15
Palacios	Matagorda	Colorado-Lavaca	70	55	41	34	33	34
Brookesmith SUD	Mills	Colorado	1	1	1	1	2	2
Corix Utilities Texas Inc	Mills	Colorado	2	2	2	2	2	3
County-Other	Mills	Brazos	21	17	13	13	13	13
County-Other	Mills	Colorado	29	24	19	18	18	19
Goldthwaite	Mills	Brazos	2	2	2	2	2	2

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Goldthwaite	Mills	Colorado	71	66	67	70	73	76
Zephyr WSC	Mills	Colorado	0	0	0	0	0	0
Corix Utilities Texas Inc	San Saba	Colorado	3	3	3	3	3	3
County-Other	San Saba	Colorado	44	44	43	43	43	44
North San Saba WSC	San Saba	Colorado	34	32	29	25	23	22
Richland SUD	San Saba	Colorado	41	38	35	31	32	33
San Saba	San Saba	Colorado	214	202	182	162	149	137
Aqua WSC	Travis	Colorado	208	240	270	304	334	362
Austin	Travis	Colorado	7,766	9,045	10,489	11,480	12,271	13,342
Barton Creek West WSC	Travis	Colorado	79	71	64	58	52	47
Barton Creek WSC	Travis	Colorado	119	127	131	130	125	121
Briarcliff	Travis	Colorado	60	68	76	85	93	106
Cedar Park	Travis	Colorado	410	393	393	393	393	393
Cottonwood Creek MUD 1	Travis	Colorado	5	5	6	6	7	7
County-Other	Travis	Colorado	172	167	165	162	157	156
County-Other	Travis	Guadalupe	2	2	2	2	2	2
County-Other (Aqua Texas - Rivercrest)	Travis	Colorado	58	52	47	42	38	34
Creedmoor-Maha WSC	Travis	Colorado	29	31	33	36	39	42
Creedmoor-Maha WSC	Travis	Guadalupe	2	2	2	2	2	3
Cypress Ranch WCID 1	Travis	Colorado	6	6	7	7	7	7
Deer Creek Ranch Water	Travis	Colorado	2	2	3	3	3	3
Elgin	Travis	Colorado	41	45	42	32	37	42
Garfield WSC	Travis	Colorado	10	12	13	14	15	16
Goforth SUD	Travis	Guadalupe	0	1	1	1	1	2
Hornsby Bend Utility	Travis	Colorado	30	34	38	41	44	47
Hurst Creek MUD	Travis	Colorado	313	281	253	228	205	185
Jonestown WSC	Travis	Colorado	124	132	141	150	158	165

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Kelly Lane WCID 1	Travis	Colorado	73	66	66	66	66	66
Lago Vista	Travis	Colorado	340	362	373	384	408	446
Lakeway MUD	Travis	Colorado	502	478	454	430	409	409
Leander	Travis	Colorado	320	594	616	645	659	686
Loop 360 WSC	Travis	Colorado	223	209	196	183	170	161
Manor	Travis	Colorado	161	204	249	302	350	395
Manville WSC	Travis	Colorado	488	589	687	799	899	993
North Austin MUD 1	Travis	Colorado	4	4	4	4	4	4
Northtown MUD	Travis	Colorado	36	42	47	53	59	63
Oak Shores Water System	Travis	Colorado	27	28	26	23	21	20
Pflugerville	Travis	Colorado	2,460	3,068	3,748	4,423	5,103	5,103
Rollingwood	Travis	Colorado	70	63	57	52	47	46
Rough Hollow in Travis County	Travis	Colorado	107	199	179	179	179	179
Round Rock	Travis	Colorado	68	79	88	99	109	118
Senna Hills MUD	Travis	Colorado	76	82	84	83	80	77
Shady Hollow MUD	Travis	Colorado	144	137	137	137	137	137
Sunset Valley	Travis	Colorado	67	69	72	75	79	82
Sweetwater Community	Travis	Colorado	82	172	172	172	172	172
Travis County MUD 10	Travis	Colorado	17	18	19	20	22	23
Travis County MUD 14	Travis	Colorado	9	10	11	12	13	14
Travis County MUD 2	Travis	Colorado	45	46	48	49	52	56
Travis County MUD 4	Travis	Colorado	341	355	360	364	360	351
Travis County WCID 10	Travis	Colorado	796	786	766	748	720	688
Travis County WCID 17	Travis	Colorado	2,132	2,076	2,056	1,882	1,791	1,848
Travis County WCID 18	Travis	Colorado	263	304	342	385	423	458

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Travis County WCID 19	Travis	Colorado	82	74	66	60	54	48
Travis County WCID 20	Travis	Colorado	106	96	86	77	70	63
Travis County WCID Point Venture	Travis	Colorado	46	53	57	62	71	82
Wells Branch MUD	Travis	Colorado	70	68	66	65	65	65
West Travis County Public Utility Agency	Travis	Colorado	1,219	1,212	1,178	1,182	1,134	1,077
Williamson County WSID 3	Travis	Colorado	20	22	20	19	19	19
Williamson Travis Counties MUD 1	Travis	Colorado	22	19	18	18	17	17
Windermere Utility	Travis	Colorado	560	560	560	560	560	560
Boling MWD	Wharton	Brazos-Colorado	12	9	7	6	6	6
County-Other	Wharton	Brazos-Colorado	185	158	138	141	143	147
County-Other	Wharton	Colorado	96	82	71	73	74	76
County-Other	Wharton	Colorado-Lavaca	31	26	23	23	24	24
County-Other	Wharton	Lavaca	3	3	2	2	2	2
El Campo	Wharton	Colorado	1	1	1	1	1	1
Wharton	Wharton	Brazos-Colorado	168	173	181	189	195	201
Wharton	Wharton	Colorado	138	142	148	154	160	165
Wharton County WCID 2	Wharton	Brazos-Colorado	83	80	78	81	84	87
Austin	Williamson	Brazos	491	625	733	849	981	1,126
County-Other	Williamson	Brazos	13	19	18	17	16	15
North Austin MUD 1	Williamson	Brazos	39	37	36	36	36	36
Wells Branch MUD	Williamson	Brazos	4	4	4	4	4	4
Total			**32,804**	**36,630**	**40,330**	**44,006**	**48,336**	**53,100**

Cost Implications of Proposed Strategy

There are two types of costs associated with drought management. One cost associated with this strategy is related mainly to public outreach and enforcement. The annual costs can vary depending on the number of customers who need to be informed of the water use restrictions, the methods chosen to reach the customers, and the level of enforcement. In some cases, increased water rates and fines can recover the expenses of public outreach. The East Bay Municipal Utility District (EBMUD) in California provided an example for costs by hiring a public outreach consultant with the goal of saving a certain amount of water. The contract was for $1.75 million with a goal of saving 36,000 ac-ft of water in June 2008. After updating to September 2018 dollars, this works out to a unit cost of $66/ac-ft.

The second type of cost is that to the water supplier (utility) in reduced water sold, as well as economic impacts to the local area by not having that water. That cost was determined using the TWDB *Socioeconomic Impacts of Projected Water Shortages.*, prepared for the 2021 planning cycle and included in *Chapter 4* of this plan. The results of that report show that utility revenue losses are $16 million in 2020, based on municipal projected shortages of 4,726 ac-ft/yr, and increase to $419 million by 2070, based on municipal projected shortages of 107,425 ac-ft/yr. This equates to a unit cost ranging from $3,385 to $3,900 per ac-ft.

Environmental Considerations

In many cases, reducing groundwater use during a drought allows for more springflow to provide water downstream. Reducing surface water use allows more water to remain in the streams, rivers, and lakes. Individual WUG implementation would be expected to have negligible impacts to the environment.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected.

<u>5.2.4.9.2. Irrigation</u>

Drought management is recommended for several of the Irrigation WUGs. Irrigation has severe shortages throughout the planning period, and drought management may be a necessary strategy to implement.

Surface water irrigators in Colorado, Matagorda, and Wharton counties receive water under the authorities of the Garwood, Lakeside, Pierce Ranch, and Gulf Coast Irrigation Districts. The LCRA Water Management Plan dictates water availability for these users based on hydrologic conditions and surface water availability. During times of drought, LCRA mandates water restrictions by curtailment of water. Because of this, irrigation surface water users were not assumed to implement drought management.

This drought management strategy would assume that during severe drought conditions, farmers that use groundwater would restrict their usage by 25 percent. In addition, drought management is recommended for Irrigation in Mills County (Brazos Basin). There are limited supplies of water in that area of the county, and it is assumed that the growth of agriculture would be reduced based on water available. The Palmer Drought Severity Index is a resource that could be used for determining triggers for these strategies. The volumes of water saved (ac-ft/yr) are also shown below in *Table 5.120*.

Table 5.120: Irrigation Drought Management Water Savings

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Irrigation	Colorado	Brazos-Colorado	3,268	3,180	3,094	3,011	2,930	2,851
Irrigation	Colorado	Colorado	1,015	988	962	936	911	886
Irrigation	Colorado	Lavaca	4,102	3,991	3,884	3,780	3,678	3,579
Irrigation	Matagorda	Brazos-Colorado	4,262	4,147	4,036	3,927	3,822	3,719
Irrigation	Matagorda	Colorado	35	34	33	32	31	31
Irrigation	Matagorda	Colorado-Lavaca	4,183	4,070	3,961	3,854	3,750	3,650
Irrigation	Mills	Brazos	149	145	141	137	134	130
Irrigation	Wharton	Brazos-Colorado	11,773	11,456	11,148	10,848	10,557	10,273
Irrigation	Wharton	Colorado	5,366	5,222	5,081	4,945	4,812	4,682
Total			**34,153**	**33,234**	**32,340**	**31,470**	**30,624**	**29,800**

Cost Implications of Proposed Strategy

Costs for drought management for irrigation were determined using the TWDB Socioeconomic Impact Analysis of Unmet Needs from the 2021 Region K Water Plan, which shows an impact cost to the local economy based on the missed opportunity to grow agriculture. This cost, which is an opportunity cost rather than an implementation cost, was used due to the fact that farming is an important part of the local economy, and the high cost of agriculture necessitates the farmers maximize their yield to generate a profit. Unit costs range from county to county. The unit cost for Irrigation WUGs in Colorado County is $192/ac-ft; the unit cost for Irrigation WUGs in Matagorda County is $168/ac-ft; the unit cost for Irrigation WUGs in Mills County is $777/ac-ft; and the unit cost for Irrigation WUGs in Wharton County is $233/ac-ft. No capital costs are associated with this strategy.

Environmental Considerations

In the case of irrigation in the lower portion of the basin, return flows can be valuable sources of streamflow during later summer months. This strategy would reduce irrigation return flows by up to 6,800 ac-ft/yr. It would also reduce the acreage of potential feedstock for migratory birds by approximately 22,000.

Agricultural & Natural Resources Considerations

Farming is an important part of the economy in the lower three counties in the region. Not supplying water to meet irrigation needs has negative economic impacts to the entire agriculture economy and rural local economies. Cost impacts are described above.

5.2.5 Municipal Water Management Strategies

The municipal WUGs include water utilities and County-Other (rural/unincorporated areas of municipal water use aggregated on a county basis).

Several strategies were identified to meet the municipal shortages including conservation; conservation was the first strategy considered for municipal WUGs with needs. For several municipal WUGs with shortages, the following regional management strategies were selected:

- Expansion of Current Groundwater Supplies
- Development of New Groundwater Supplies
- Water Importation
- Aquifer Storage and Recovery
- Water Purchase
- Drought Management

These regional strategies are explained in detail in *Section 5.2.4* of this report.

In addition to these strategies, several municipal WUGs with shortages purchase water from LCRA. Amendments to these LCRA contracts or new LCRA contracts are also identified as a strategy to meet shortages. These strategies are explained in *Sections 5.2.3.1.3*, *0*, *06*, and *07*.

In addition to the strategies identified above, additional municipal strategies have been identified to meet specific WUG needs. The following sections provide a description, analysis, and cost breakdown for these municipal strategies.

5.2.5.1 Municipal Conservation

Municipal conservation is covered in the required consolidated Conservation section of *Chapter 5*. More specifically, it is discussed in *Section 5.2.2.3*, Municipal Conservation.

5.2.5.2 Wharton Water Supply

Diminishing reliability of groundwater supplies have caused the Wharton Water User Group (WUG) to proactively develop water supply strategies that could enable it to meet the water demands for area growth not otherwise planned for in regional water planning. It believes that its proximity to the Houston urban area and the new I-69 corridor will increase its water demands during the next fifty years beyond those otherwise anticipated in regional water planning. A regional water supply study for the City of Wharton and East Bernard, published April 2017, detailed three alternative supply sources to provide additional water: surface water, additional groundwater, and aquifer storage and recovery. Of the alternatives, the study recommended the use of additional groundwater from the Gulf Coast Aquifer.

This strategy is described in detail in the Expanded Local Use of Groundwater section of this report as a recommended strategy. See *Section 5.2.4.1.4* for additional information.

5.2.5.3 Bastrop Regional Project

Combined with an increasing demand and limited groundwater, the following entities within Bastrop County are likely to require a new contract with LCRA for surface water supply from the Highland Lakes; Aqua Water Supply Corporation (WSC), Bastrop, and Bastrop County WCID 2. All would require new infrastructure to treat surface water as they currently have groundwater treatment and distribution infrastructure. See *Section 5.2.3.1.7*, New LCRA Contracts with Infrastructure, for strategy details.

5.2.5.4 Direct Potable Reuse

Direct Potable Reuse (DPR) is a water supply strategy that reclaims wastewater effluent to potable water quality and distributes treated potable water to users via a centralized distribution system. DPR is proposed as a strategy for three municipal WUGs within Region K.

Table 5.121 and *Table 5.122* list the project yields and associated costs, respectively, for each of the WUGs. Following the tables, each WUG has an individual section where details are discussed further.

Table 5.121: Direct Potable Reuse Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Buda	Hays	Colorado	0	2,240	2,240	2,240	2,240	2,240
Dripping Springs WSC	Hays	Colorado	0	560	560	560	560	560
Llano	Llano	Colorado	0	280	280	280	280	280
West Travis County PUA	Hays, Travis	Colorado	0	336	336	336	336	336

Table 5.122: Direct Potable Reuse Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Buda	Hays	Colorado	$24,148,000	$33,503,000	$4,399,000	$1,964
Dripping Springs WSC	Hays	Colorado	$8,736,000	$12,119,000	$1,446,000	$2,582
Llano	Llano	Colorado	$7,432,000	$10,415,000	$1,054,000	$3,764
West Travis County PUA	Hays, Travis	Colorado	$5,606,000	$7,788,000	$972,000	$2,893

5.2.5.4.1. Buda

Buda has contracted with the consulting engineer responsible for design of the Buda WWTP Phase III Expansion project to perform a Feasibility Study for evaluation of direct potable water reuse (DPR) alternatives. A draft Feasibility Study Report was submitted in May 2015 that defined feasibility, anticipated treatment process, proposed improvements, regulatory requirements, and planning-level cost estimates for a potential 1.5 MGD to 2 MGD Direct Potable Reuse project. This reuse project would be in addition to the non-potable direct reuse project recommended for Buda, as discussed in *Section 5.2.5.5*.

As part of the feasibility study phase, Buda met with TCEQ staff involved in approval of DPR projects. This meeting confirmed the regulatory feasibility of the proposed DPR project and provided definition of the procedures required by TCEQ for implementation. A 12-month detailed effluent characterization study followed and was completed in 2018. Pilot testing design has begun and is anticipated to be completed by 2021. After the completion of pilot testing, and approved permits from TCEQ are obtained, full-scale design and construction are anticipated to be completed before 2030.

This strategy is expected to provide 2,240 ac-ft/yr of potable water supply, beginning in the 2030 decade and extending through the planning period to 2070.

Cost Implications of Proposed Strategy

Based on the Feasibility Study Report assumptions and preliminary findings, the cost estimate includes a DPR WTP with 2.0 MGD capacity; modifications at the Buda WWTP site including effluent transfer pumping facilities and biological denitrification process; facilities for treatment and disposal of wastes from the DPR WTP treatment process under a TPDES permit; and offsite finished water pipeline, storage, and blending facilities. The costs from the Feasibility Study Report were reported in May 2015 dollars.

The cost of water purchase of the treated water has not been valued in this cost estimate, as no water purchase cost has been identified at this time. This assumption may be reevaluated in future regional water planning cycles.

Costs from the Feasibility Study Report were converted from May 2015 dollars to September 2018 dollars and input into the Texas Water Development Board's Cost Estimating Tool. The total facilities cost for this strategy is $24,148,000; the total project cost is $33,503,000; the total annual cost is $4,399,000; and the unit cost is $1,964/ac-ft/yr.

Environmental Considerations

If Buda decides to proceed with implementation of Direct Potable Reuse, it is anticipated that residuals from the DPR WTP treatment process would be further treated, then co-disposed under a TPDES permit with any remaining Buda WWTP effluent, accounting for diversions for direct non-potable and potable reuse. As a result, the Total Dissolved Solids (TDS) concentration of the WWTP effluent return flow to the Plum Creek watershed would be increased but remain within water-quality based limits authorized by TCEQ through the TPDES permitting process. Regulated constituents (chloride, sulfate) concentrations in the return flow to Plum Creek would also be increased, subject to TPDES permit limits.

For discharge to Andrews Branch, TCEQ's water quality modeling method is based on existing ambient segment concentrations of 867.8 mg/L TDS, 117.5 mg/L chloride, and 88 mg/L sulfate, and segment criteria of 1,120 mg/L TDS, 350 mg/L chloride, and 150 mg/L sulfate. Preliminary evaluations done for the DPR Feasibility Study indicated that TPDES limits of 1,314 to 1,324 mg/L TDS and 178 mg/L sulfate may be needed for disposal of residuals from a proposed 2 MGD DPR WTP treatment process through co-discharge with 1.5 MGD of WWTP effluent. TPDES limits did not appear to be required for chloride. Having completed its 12-month effluent characterization study in 2018, Buda is in the process of defining anticipated DPR WTP residuals and resulting blended discharge water quality parameters.

Buda discharges treated effluent to tributaries of Plum Creek, and by increasing the effluent reuse, this strategy will reduce the effluent discharge to natural waterways by up to 2,240 ac-ft/yr.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.4.2. Dripping Springs WSC

In addition to reuse water allocated for non-potable direct reuse (see *Section 5.2.5.5*), Dripping Springs is looking at the option of allocating a portion of produced wastewater effluent for potable reuse. In preparation for a DPR project, Dripping Springs completed a feasibility study in April 2015 which examined treatment methods, regulatory requirements, and planning-level capital costs.

The results of this study indicated that DPR is a feasible option for Dripping Springs. The most cost-effective treatment option, ozone-biofiltration, was recommended for further consideration. Pilot testing, determination of residual disposal method, and permitting through TCEQ will need to be completed prior to project implementation.

This strategy would supply 560 ac-ft/yr (0.5 MGD), beginning in the 2030 decade and extending through the planning period to 2070.

Cost Implications of Proposed Strategy

Infrastructure required to implement this strategy includes:

- Retrofitting of the existing wastewater treatment plant, including biological nutrient removal
- 0.5 MGD DPR water treatment plant (includes advanced oxidation via ozone, biofiltration, ultrafiltration, UV disinfection, chlorine disinfection, and pH stabilization)
- Engineered storage buffer
- 0.5 MGD high service pump station and 8-inch PVC water line to convey DPR finished water to existing treated storage tank, allowing for tie-in into existing water system
- Outfall structure for backup WWTP effluent discharge to Walnut Springs Creek (required for permitting)

The cost of water purchase of the treated water has not been valued in this cost estimate, as no water purchase cost has been identified at this time. This assumption may be reevaluated in future regional water planning cycles.

Costs from the *City of Dripping Springs Direct Potable Reuse Feasibility Study* (April 2015) were converted from April 2015 dollars to September 2018 dollars and input into the Texas Water Development Board's Cost Estimating Tool. For this strategy, the total facilities cost is $8,736,000; the total project cost is $12,119,000; the total annual cost is $1,446,000/yr; and the annual unit cost is $2,582/ac-ft.

Environmental Considerations

Due to the increased wastewater effluent production as its population increases, Dripping Springs anticipates the need to discharge treated effluent into Walnut Springs Creek. Substantial implementation of direct potable reuse of effluent can mitigate or eliminate the need to discharge into Walnut Springs Creek.

As a part of the permitting process through TCEQ, a disposal method for the DPR WTP treatment residuals will need to be identified. Because the concentrations of regulated constituents (Total Dissolve Solids, chloride, sulfate, etc.) will be higher through DPR than conventional wastewater treatment, alternatives to land application or direct discharge may need to be pursued, including but not limited to: deep well injection, evaporation ponds, mechanical evaporation, or brine crystallization.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

5.2.5.4.3. Llano

Llano requested a direct potable reuse strategy to be included for use in emergency drought conditions. In preparation for a DPR project, Llano will need to complete a feasibility analysis, pilot testing, and obtain relevant permits from the TCEQ.

This strategy is expected to provide 280 ac-ft/yr of potable water supply. This strategy will be included as a supply beginning in the 2030 decade and extending through the planning period to 2070.

Cost Implications of Proposed Strategy

Infrastructure required to implement this strategy includes:

- 0.25 MGD DPR treatment plant (includes reverse osmosis, microfiltration or ultrafiltration, ultraviolet disinfection, advanced oxidation processes, and pH stabilization)
- 6-in, 2-mile, above-ground transmission main and associated pumps to deliver treated water from the DPR plant to existing conventional water treatment plant for blending
- High service pump station expansion at existing wastewater treatment facility, to transmit water from advanced wastewater treatment to water treatment plant

The cost of water purchase of the treated water has not been valued in this cost estimate, as no water purchase cost has been identified at this time. This assumption may be reevaluated in future regional water planning cycles.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. A 0.25 MGD advanced treatment plant was included in the costing to cover necessary additional treatment of the wastewater effluent before transmission to the water treatment plant. It is assumed additional treatment infrastructure would be added as an expansion to the existing wastewater treatment facilities. The cost of a 0.25 MGD DPR treatment plant was entered as an external cost based on estimated costs of advanced treatment facilities for the Buda and Dripping Springs direct potable reuse strategies. It was assumed that the cost of installing an above-ground pipeline per linear foot would be approximately half of the cost of a buried pipe installation. For this strategy, the total facilities cost is $7,432,000; the total project cost is $10,415,000; the total annual cost is $1,054,000/yr; and the annual unit cost is $3,764/ac-ft. Costs do not include concentrate disposal or upgrades to the existing water treatment plant that may be required by TCEQ.

Environmental Considerations

As a part of the permitting process through TCEQ, a disposal method for the DPR WTP treatment residuals will need to be identified. Because the concentrations of regulated constituents (Total Dissolve Solids, chloride, sulfate, etc.) will be higher through DPR than conventional wastewater treatment, alternatives to land application may need to be pursued, including but not limited to: deep well injection, evaporation ponds, mechanical evaporation, or brine crystallization.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.4.4. West Travis County PUA

In addition to their allocation for non-potable direct reuse (see *Section 5.2.5.5*), West Travis County PUA requested that Region K include a strategy in the 2021 Plan for them to allocate a portion of produced wastewater effluent for potable reuse. In preparation for a DPR project, West Travis County PUA will need to complete a feasibility analysis, pilot testing, and obtain relevant permits from the TCEQ.

This strategy is expected to provide 336 ac-ft/yr of potable water supply, beginning in the 2030 decade and extending through the planning period to 2070.

Cost Implications of Proposed Strategy

Infrastructure required to implement this strategy includes:

- 0.3 MGD DPR treatment plant (includes reverse osmosis, microfiltration or ultrafiltration, ultraviolet disinfection, advanced oxidation processes, and pH stabilization)
- 6-in, 0.5-mile transmission main and associated pumps to deliver treated water from the DPR plant to existing conventional water treatment plant for blending
- High service pump station expansion at existing water treatment facility, to transmit water produced via DPR to distribution system

The cost of water purchase of the treated water has not been valued in this cost estimate, as no water purchase cost has been identified at this time. This assumption may be reevaluated in future regional water planning cycles.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total facilities cost is $5,606,000; the total project cost is $7,788,000; the total annual cost is $972,000/yr; and the annual unit cost is $2,893/ac-ft. Costs do not include concentrate disposal or upgrades to the existing wastewater treatment plant to meet influent criteria for the DPR plant.

Environmental Considerations

West Travis County PUA cannot discharge wastewater into the Highland Lakes, so direct potable reuse presents an alternative to disposal via land application.

As a part of the permitting process through TCEQ, a disposal method for the DPR WTP treatment residuals will need to be identified. Because the concentrations of regulated constituents (Total Dissolve Solids, chloride, sulfate, etc.) will be higher through DPR than conventional wastewater treatment, alternatives to land application may need to be pursued, including but not limited to: deep well injection, evaporation ponds, mechanical evaporation, or brine crystallization.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5 Direct Reuse (Non-Potable)

Direct Reuse is recommended as a strategy for several municipal WUGs within Region K. *Table 5.123* and *Table 5.124* summarize the project yields and associated costs, respectively, for each of the WUGs, with the exception of Austin, which is discussed in *Sections 5.2.3.2.7 and 5.2.3.2.8*. Following the tables, each WUG then has an individual section where details are discussed further. There are many other municipal WUGs that have active reuse programs, but do not have a recommended reuse strategy.

Table 5.123: Direct Reuse Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Blanco	Blanco	Guadalupe	0	146	146	146	146	146
Horseshoe Bay	Burnet, Llano	Colorado	0	154	154	154	154	154
Marble Falls	Burnet	Colorado	0	100	200	300	400	500
Meadowlakes	Burnet	Colorado	75	75	75	75	75	75
Fredericksburg	Gillespie	Colorado	0	132	132	132	132	132
Buda	Hays	Colorado	100	1,120	1,120	1,120	1,680	1,680
Dripping Springs WSC	Hays	Colorado	0	390	460	531	601	672
West Travis County PUA	Hays, Travis	Colorado	0	224	224	224	224	224
Lago Vista	Travis	Colorado	0	224	336	448	560	673
Lakeway MUD	Travis	Colorado	0	450	450	900	900	900
Travis County WCID 17	Travis	Colorado	0	510	510	510	510	510

Table 5.124: Direct Reuse Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Blanco	Blanco	Guadalupe	$770,000	$1,110,000	$103,000	$705
Horseshoe Bay	Burnet, Llano	Colorado	$781,000	$1,084,000	$103,000	$669
Marble Falls	Burnet	Colorado	$980,000	$1,388,000	$148,000	$296
Meadowlakes	Burnet	Colorado	$0	$0	$0	$0
Fredericksburg*	Gillespie	Colorado	$7,335,000	$10,175,000	$789,000	$5,977
Buda	Hays	Colorado	$0	$0	$0	$0
Dripping Springs WSC	Hays	Colorado	$1,045,000	$1,450,000	$169,000	$251
West Travis County PUA	Hays, Travis	Colorado	$31,000	$207,000	$27,000	$121
Lago Vista	Travis	Colorado	$153,000	$212,000	$94,000	$140
Lakeway MUD	Travis	Colorado	$1,952,000	$2,736,000	$275,000	$306
Travis County WCID 17*	Travis	Colorado	$6,510,000	$9,030,000	$719,000	$1,410

* Costs for WUGs marked with an asterisk were calculated by inputting external capital costs provided by the WUG, adjusted to September 2018 dollars, into the TWDB's Unified Costing Model (UCM).

The cost of water purchase of the treated water has not been valued in this cost estimate, as no water purchase cost has been identified at this time. This assumption may be reevaluated in future regional water planning cycles.

5.2.5.5.1. Blanco

Blanco's wastewater treatment plant produces approximately 146 ac-ft/yr of effluent. Currently, Blanco uses approximately 30% of produced wastewater effluent for applications on the site of the wastewater treatment plant. Blanco is in the process of obtaining a permit from TCEQ to allow distribution of reclaimed water and plans to distribute the entirety of effluent produced. This strategy would supply 146 ac-ft/yr of reclaimed water for irrigation and construction uses, to be online by 2030.

Cost Implications of Proposed Strategy

Anticipated infrastructure needs for the proposed 146 ac-ft/yr include:

- Transmission piping to deliver water to irrigation customers
- High service pump station
- Storage tank on WWTP site

Regional planning guidelines do not allow distribution-level costs to be included in the regional water plans. As such, transmission piping to deliver water to customers will be required to implement this strategy but will not be included in the cost estimate for regional planning purposes. It will be assumed a pump station will be added on site of WWTP for the newly constructed reclaimed water system.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $1,110,000; the total annual cost is $103,000/yr; and the annual unit cost is $705/ac-ft.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5.2. Horseshoe Bay

Horseshoe Bay has a reclaimed water system of Type I Designation through a TCEQ reuse permit. Horseshoe Bay currently supplies approximately 516 ac-ft/yr of reuse water for irrigation of various golf courses. This strategy would utilize an additional 154 ac-ft/yr of reuse water by transmitting reclaimed water to the Summit Rock Golf Course (located in Llano County) via a 12-inch transmission line. This strategy is anticipated to be online by 2030.

Because centralized sewer systems in the Highland Lakes area cannot return effluent to the lakes, there is much potential to use effluent in place of raw lake water supply. Horseshoe Bay is considering additional use of reclaimed water and may identify additional reclaimed infrastructure needs in the future.

Cost Implications of Proposed Strategy

Infrastructure required to implement this strategy includes:

- 5,500 ft of 12-inch transmission line
- Two road crossings via directional drilling
- High service pump station to be installed at the existing effluent pond

The 5,500-ft, 12-inch transmission line is anticipated to deliver reclaimed water to the Summit Rock Golf Course for irrigation use. As regional planning guidelines do not allow distribution-level costs to be included in the regional water plans, the transmission line will not be included in the cost estimate for regional planning purposes.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. Planned infrastructure reported by Horseshoe Bay was input into the costing tool to determine total and annual costs. For this strategy, the total project cost is $1,084,000; the total annual cost is $103,000/yr; and the annual unit cost is $669/ac-ft.

Environmental Considerations

Horseshoe Bay cannot discharge water into the Highland Lakes, and therefore has no discharge point currently. Use of reclaimed water offers an alternative to disposal. Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

Golf courses in the area draw some water from Lake LBJ for irrigation. In addition to replacing use of potable water for irrigation, wastewater effluent can be used in place of raw lake water for irrigation in Horseshoe Bay, requiring less water to be drawn from the Highland Lakes surface water.

5.2.5.5.3. Marble Falls

Marble Falls currently supplies approximately 1.5 MGD (approximately 1,680 ac-ft/yr) of reuse water for the irrigation of city parks, golf courses, and other users in Burnet County. Marble Falls is currently completing a study assessing a potential expansion of their wastewater treatment plant which would include upgrades and an additional capacity resulting in increased effluent. This study is in its early stages and additional reclaimed water supplies related to expansion will be distributed.

There is a need for expanded transmission infrastructure to provide direct reuse to future customers. This strategy would provide 100 ac-ft/yr of direct reuse by 2030, with an ultimate supply of 500 ac-ft by 2070.

Cost Implications of Proposed Strategy

Marble Falls currently has infrastructure in place for distributing reclaimed water; as such, it will be assumed that most costs associated with this strategy will be related to expanding distribution (i.e. adding transmission piping). In addition, there may be need for additional storage and pumping capacity due to increased WWTP capacity and reclaimed water supply when the WWTP is expanded.

Infrastructure required to implement this strategy may include:

- Transmission piping
- Storage tank
- High service pump station

Regional planning guidelines do not allow distribution-level costs to be included in the regional water plans. As such, transmission piping to deliver water to customers will be required to implement this strategy but will not be included in the cost estimate for regional planning purposes. Cost of a new pump station will be included in the estimate under the assumption additional on-site pumping will be required for increased effluent due to plant expansion.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $1,388,000; the total annual cost is $148,000/yr; and the annual unit cost is $296/ac-ft.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

5.2.5.5.4. Meadowlakes

Meadowlakes utilizes the entirety of the 140,000 gallons per day (gpd) of wastewater effluent it produces for irrigation. Meadowlakes has recently begun a project to reuse Marble Falls effluent for a yield of 75 ac-ft/yr of reclaimed water for irrigation use. The project has already been constructed and will thus be considered online by 2020.

Cost Implications of Proposed Strategy

There are no cost implications associated with this strategy, as it has already been constructed.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for wastewater treatment plant expansion.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5.5. Fredericksburg

Fredericksburg produces approximately 1,568 ac-ft of wastewater effluent per year. In the summer months, most of the produced effluent is applied to golf courses for irrigation; in winter months, when irrigation demands are low, a portion of the effluent is discharged into a receiving stream. Adding reclaimed water storage would allow for winter effluent to be captured for use in the summer to supply existing and future customers with reclaimed water. This strategy will provide a method of capturing 132 ac-ft/yr (43 million gallons per year) of otherwise discharged winter effluent. The strategy is assumed to be online by 2030.

Cost Implications of Proposed Strategy

Infrastructure required for this strategy includes:

- 43-million-gallon reclaimed water reuse pond that would be built on-site at the WWTP
- Above-ground storage tank could be considered as an alternative method for effluent storage, however costs for this option would be significantly higher
- Pump Station
- Existing transmission mains would be used

Additional reclaimed water infrastructure may be identified in the future as effluent generation and non-potable use demands increase.

External capital costs were provided from the Water, Wastewater, and Reuse System Plan (Freese and Nichols, February 2017) and input into the Texas Water Development Board Cost Estimating Tool, converted to September 2018 dollars. For this strategy, the total project cost is $10,175,000; the total annual cost is $789,000/yr; and the annual unit cost is $5,977/ac-ft.

Distribution-level infrastructure and associated costs are not included in regional water planning but will be required to implement this strategy.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5.6. Buda

Buda currently owns one wastewater treatment plant, which is operated and maintained by the Guadalupe-Blanco River Authority (GBRA). Reclaimed water implementation for Buda consists of multiple related projects funded through Buda's "Purple Pipe Fund." This funding is provided for irrigation of some parks & road medians with Type I reclaimed water, along with the bulk sale of Type I reclaimed water for non-potable uses, improving the condition of grass/landscaping while reducing demand on Buda's drinking water supply. Buda intends to expand reclaimed water implementation through its Capital Projects program and anticipates that the implementation of this strategy will continue to reduce the potable water supply demand by Buda.

This strategy would provide an expansion of reclaimed water service primarily for the Sunfield subdivision, located east of Buda. This strategy is expected to be partially online by 2030, to supply 1,120 ac-ft/yr, with a full capacity of 1,680 ac-ft/yr (1.5 million gallons per day) by 2070. Another potential reclaimed water user identified through the planning process is the Mining WUG in Hays County. Mining has water needs in Hays County and does not require potable water to meet a large portion of those needs. Mining in Hays County is identified in *Section 5.2.4.7* as a potential water purchaser of reuse water from Buda.

Buda's direct reuse system may require additional infrastructure beyond this scope in the future, depending on future demands of the contributing areas of Buda. Additionally, a portion of generated wastewater effluent will be treated and utilized for Buda's Direct Potable Reuse strategy (*Section 5.2.5.4.1*), thus proposed yields for direct reuse may shift in favor of allocation for potable supply in later decades.

Cost Implications of Proposed Strategy

The capital cost for this strategy is primarily driven by the length of the proposed new pipeline and new effluent pump station additions. It is assumed that the plant already has conventional treatment processes for BOD removal and disinfection in place to meet TCEQ reclaimed water Type I requirements. The pipeline proposed for this strategy is 24-inch in diameter, spanning approximately 3.75 miles from Buda's wastewater treatment plant to the proposed Sunfield subdivision east of Buda, but may service other irrigation sites of interest, such as Stagecoach Park, City Park or various roadway medians.

Infrastructure needed for the proposed 1,680 ac-ft/yr includes:

- Approximately 4 miles of transmission line

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. Planned infrastructure reported by Buda was input into the costing tool to determine total and annual costs. The planned 4-mile transmission line for this project was not included as distribution level costs are not included per regional planning guidelines. Because only distribution level costs are required for this strategy, associated costs are $0 for regional planning purposes.

Environmental Considerations

The main advantage the reuse water strategy has over other strategies is that it may be implemented at a low cost, while reducing the need for expanded water supplies. Buda discharges treated effluent to tributaries of Plum Creek, and by increasing the effluent reuse, will reduce the effluent discharge to natural waterways by up to 1,680 ac-ft/yr.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

<u>5.2.5.5.7. Dripping Springs WSC</u>

Dripping Springs is in Hays County, an area which has experienced large amounts of population growth in the past 10 years and is provided water by Dripping Springs WSC. There is a need for Dripping Springs to increase wastewater treatment capacity for future growth. In response Dripping Springs has filed to increase its TLAP-permitted capacity and obtained a TPDES discharge permit, including the approval of a reclaimed water system. A wastewater treatment plant expansion is anticipated to be constructed from 2019-2022 and will include biological nutrient removal.

Currently, the South Regional Wastewater Collection, Treatment and Disposal Facility permitted capacity is 348,500 GPD (390 ac-ft/yr). Dripping Springs plans to use up to 100% of the effluent generated for direct reuse by 2030. Pending TCEQ approval of the plant’s expanded capacity to 995,000 GPD, approximately 600,000 GPD (672 ac-ft/yr) of the effluent would be diverted to direct reuse. With the planned wastewater expansion pending, additional reclaimed water will be available to service existing and new end-users, including: Sports Park, Charro Park, the Caliterra development, hay fields near the wastewater treatment plant, Howard Ranch subdivision, construction processes, irrigation of certain food crops, and other developments planned nearby. To serve these customers, additional infrastructure is needed.

This strategy would provide approximately 390 ac-ft/yr of direct reuse by 2030, with a full capacity of approximately 672 ac-ft/yr supplied by 2070. Dripping Springs also plans to use wastewater effluent for Direct Potable Reuse, as discussed in *Section 5.2.5.4.2*. Thus, proposed yields for direct reuse may shift in favor of allocation for potable supply in later decades.

Cost Implications of Proposed Strategy

Infrastructure needed for the proposed 672 ac-ft/yr includes:

- High service pump station
- Ground storage tank
- Transmission main to irrigation customers

Regional planning guidelines do not allow distribution-level costs to be included in the regional water plans. As such, transmission piping to deliver water to customers will be required to implement this strategy but will not be included in the cost estimate for regional planning purposes. Cost of a new pump station will be included in the estimate under the assumption additional pumping on-site of WWTP will be required for increased reclaimed water flow due to plant expansion.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $1,450,000; the total annual cost is $169,000/yr; and the annual unit cost is $251/ac-ft.

Environmental Considerations

Due to the increased wastewater effluent production as its population increases, Dripping Springs anticipates the need to discharge treated effluent into Walnut Springs Creek. Substantial implementation of direct reuse of effluent can mitigate or eliminate the need to discharge into Walnut Springs Creek.

Agricultural & Natural Resources Considerations

In the preliminary engineering report for the South Regional Wastewater System Expansion Study, a proposed potential use of reclaimed wastewater effluent was irrigation of hay fields as well as some food crops of varieties that would come into minimal contact with the treated effluent and fit requirements set in the Texas Administrative Code (30 TAC, Chapter 210.24(s)). Disposal of effluent through distribution as reclaimed water would be beneficial because Dripping Springs faces limited land available for drip irrigation disposal near the WWTP. Available land will continue to be restricted as development continues in the vicinity.

5.2.5.5.8. West Travis County PUA

West Travis County PUA has several projects planned to expand direct reuse supply by 2030. Supply will be expanded to Bee Cave City Park, Falconhead, and Ladina Subdivision for residential and irrigation uses. A total of approximately 224 ac-ft/yr will be distributed, including effluent going to drip irrigation fields. This strategy is anticipated to be online by 2030.

Cost Implications of Proposed Strategy

Infrastructure to increase beneficial use supply will include:

- Extension of existing reclaimed transmission line
- Reclaimed water storage tank

- High service pump station
- Drip irrigation system, assumed to be $1,200/ac, per the 2004 Texas Water Development Board (TWDB) Report 362

West Travis County PUA is also interested in installing a reverse osmosis filtration and membrane system, which is considered in the cost for the Direct Potable Reuse Strategy for West Travis County PUA (see *Section 5.2.5.4.4*). Per regional planning guidelines, distribution-level infrastructure and associated costs are not to be included in the regional water plans. As such, the cost of reclaimed water drip irrigation and the extension to the existing reclaimed transmission piping are not included. As this strategy is an expansion of an existing reclaimed water system, it is assumed any additional pump stations will be associated with distribution-level costs as well and are not included.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $207,000; the total annual cost is $27,000/yr; and the annual unit cost is $121/ac-ft.

Environmental Considerations

West Travis County PUA cannot discharge into the Highland Lakes, so direct reuse presents a good disposal alternative. Additionally, increasing use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

<u>5.2.5.5.9. Lago Vista</u>

Lago Vista currently produces approximately 504 ac-ft/yr of reclaimed water for golf course irrigation and plans to expand their reclaimed water system to deliver non-potable water to a centralized distribution system for residential use. Beyond the existing reclaimed water produced for golf course irrigation, this strategy would provide 224 ac-ft/yr of additional reclaimed water by 2030, with full expansion to 673 ac-ft/yr by 2070.

Cost Implications of Proposed Strategy

Lago vista has an existing reclaimed water system. This strategy is comprised of expanding that existing system to residential use. Infrastructure required for this strategy includes:

- Reclaimed water storage tanks
- Re-chlorination system
- Expansion of reclaimed water transmission piping to residential customers

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $212,000; the total annual cost is $94,000/yr; and the annual unit cost is $140/ac-ft. Per regional planning guidelines, distribution-level infrastructure and associated costs will not be included in the regional water plans, therefore the cost of extending existing water transmission and any additional pumping that may be required for the new portion of the line were not considered in this cost estimate.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for wastewater treatment plant expansion

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5.10. Lakeway MUD

Lakeway Municipal Utility District (LMUD) is seeking to expand its existing direct reuse system. Approximately 324 residences are currently served by the reuse system, which provides approximately 97 ac-ft/yr of reclaimed water.

LMUD currently produces 673 ac-ft/yr of reclaimed water for golf courses, city medians and parks used by the City of Lakeway and other commercial entities throughout the Lakeway community. LMUD has immediate plans to expand the reclaimed water system to service an additional 324 residences (approximately 97 ac-ft/yr demand) by 2021.

LMUD plans to continue further expansion of the reclaimed water system to beneficially reuse all reclaimed water produced from an approximate 900 ac-ft/yr expansion of their 5-5 Water Recycling Plant. The expansion is needed to service nearby MUDs and extend centralized wastewater service to out-of-district Lakeway areas currently using septic systems. These expansions are anticipated to occur in two phases: the first to provide 450 ac-ft/yr by 2025, and the second to provide an additional 450 ac-ft/yr likely occurring roughly 10 years later. Infrastructure associated with expansion of the reclaimed water system will include reclaimed water storage ponds, storage tanks, force mains and pump stations.

This strategy would be online by 2030, providing 450 ac-ft/yr, with an ultimate capacity of 900 ac-ft/yr from 2050 onward.

Cost Implications of Proposed Strategy

Infrastructure required to implement this strategy includes:

- Reclaimed water storage tanks
- Reclaimed water storage ponds
- Force mains and pump stations

Force mains and pump stations were not included in estimate, as regional planning guidelines do not allow distribution-level costs to be included in the regional water plans. Because this strategy is comprised of expanding an existing reclaimed water distribution system, it is assumed no new pump stations will be built on the WWTP, and any new pump stations constructed will be considered distribution-related costs.

Costs were developed using the Texas Water Development Board Cost Estimating Tool and reported in September 2018 dollars. For this strategy, the total project cost is $2,736,000; the total annual cost is $275,000/yr; and the annual unit cost is $306/ac-ft.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected as a result of implementing this strategy.

5.2.5.5.11. Travis County WCID 17

Travis County WCID 17 has seventeen planned improvement projects for the Flintrock Effluent Disposal and Reclaimed Irrigation System. This system will provide Type I effluent to a series of existing and proposed effluent disposal fields and reclaimed water irrigation systems and will include improvements to storage, pumping, and transmission. Eight of the planned improvement projects will increase direct reuse supplies for irrigation, distributing a proposed total of 510 ac-ft/yr of reclaimed water to irrigation fields.

Reclaimed water projects among the planned improvements include:

- Flintrock Effluent Storage Basin, Reclaimed Water Irrigation Pump Station, Effluent Transfer Pumps Station & Effluent Main
- Lakeway Regional Effluent Control Valve Assembly
- Serene Hills Storage Tank #1
- Flintrock Golf Course Rough Irrigation
- Serene Hills Storage Tank #2
- Serene Hills R.O.W. Irrigation Conversion
- Serene Hills Effluent Pump Station and Effluent Main
- Reuse Irrigation Pump Expansion

Construction is anticipated to begin from fiscal year 2021 to 2022, with planned completion dates from 2021-2026. The yield for this strategy is 510 ac-ft/yr and is anticipated to be online in 2030. Infrastructure associated with these projects include reclaimed water storage basins, storage tanks, force mains, and pump stations.

Cost Implications of Proposed Strategy

Capital costs for this strategy were provided by a consultant for Travis County WCID 17. Because regional planning guidelines do not allow the inclusion of distribution-level costs in the regional water plans, some of the projects listed above were not considered for this estimate, including: Lakeway Regional Effluent Control Valve Assembly, Flintrock Golf Course Rough Irrigation, Serene Hills R.O.W. Irrigation Conversion, Serene Hills Effluent Pump Station and Effluent Main, and Reuse Irrigation Pump Expansion. As these projects are related to adding pipe lines, valves, and pump stations to distribute reclaimed water, they are assumed to be entirely distribution-level costs.

Capital costs were input into the Texas Water Development Board Cost Estimating Tool in September 2018 dollars. Annual costs were generated by the costing tool. For this strategy, the total project cost is $9,030,000; the total annual cost is $719,000/yr; and the annual unit cost is $1,410/ac-ft.

Environmental Considerations

Increased use of reclaimed water for applications that do not require potable water will mitigate pressure on drinking water supplies and potentially delay need for expansion of water supplies.

Agricultural & Natural Resources Considerations

No impacts to agriculture are expected, as a result of implementing this strategy.

5.2.6 Irrigation Water Management Strategies

The existing water supplies available to the irrigators in Region K are not enough to meet the projected needs. A shortage would occur in all decades of the planning period should the critical drought be repeated. Using the Region K Cutoff Model with no return flows and assuming full use of the ROR irrigation rights to meet irrigation demands in those operations, the maximum annual shortage is projected to decrease from 254,000 ac-ft/yr in 2020 to approximately 186,000 ac-ft/yr in 2070. The calculated shortages are expected to decrease due to projected decreases in water demand. *Table 5.125* shows the water needs for all the Irrigation WUGs in Region K and the number of WUGs with water deficits for each decade.

Table 5.125: Total Irrigation Water Needs

Category Name	Water Needs (ac-ft/yr)					
	2020	2030	2040	2050	2060	2070
Irrigation	(254,364)	(239,922)	(225,869)	(212,193)	(198,886)	(185,938)
No. of WUGs with Need	9	9	9	9	9	9

Irrigation in Mills County has water needs of 1,737 ac-ft/yr starting in 2020. The strategies identified to meet those needs are as follows:

- Drought Management (Discussed in *Section 5.2.4.9.2*)
- Irrigation Conservation – Drip Irrigation (Discussed in *Section 5.2.4.1.6*)
- Expand Use of the Trinity Aquifer (Discussed in *Section 5.2.4.1.6*)

The water needs for Irrigation in Mills County are not fully met through these three strategies, leaving unmet needs for Irrigation in Mills County ranging from 829 ac-ft/yr in 2020 to 848 ac-ft/yr in 2070. Irrigation needs separate from Mills County are identified in *Table 5.126* and correspond to Colorado, Matagorda, and Wharton Counties. The strategies recommended by the LCRWPG for Irrigation in these counties are summarized in *Table 5.127*.

Table 5.126: Irrigation Water Needs in Rice-Growing Counties

County	Water Needs (ac-ft/yr)					
	2020	2030	2040	2050	2060	2070
Colorado	(54,318)	(49,661)	(45,130)	(40,720)	(36,429)	(32,254)
Matagorda	(123,222)	(118,068)	(113,053)	(108,173)	(103,424)	(98,803)
Wharton	(75,087)	(70,456)	(65,949)	(61,563)	(57,296)	(53,144)
Total	**(252,627)**	**(238,185)**	**(224,132)**	**(210,456)**	**(197,149)**	**(184,201)**

All the recommended strategies are discussed in other sections of *Chapter 5*. The identified sections are as follows:

- Drought Management (Discussed in *Section 5.2.4.9.2*)
- On-Farm Conservation (Discussed in *Section 5.2.2.5.1*)
- Irrigation Operations Conveyance Improvements (Discussed in *Section 5.2.2.5.2*)
- Sprinkler Irrigation (Discussed in *Section 5.2.2.5.3*)
- Real-Time Use Metering and Monitoring (Discussed in *Section 5.2.2.5.34*)
- Return Flows (Discussed in *Section 5.2.1.1*)
- LCRA WMP Interruptible Water (Discussed in *Section 5.2.3.1.2*)

In addition, while not a yield-producing strategy, HB 1437 is a funding mechanism for implementing strategies including those for irrigation. HB 1437 requires water being transported out of the Colorado River Basin to the Brazos River Basin to be replaced to the extent that there is no net loss of surface water in the Colorado River Basin. One of the methods for replacing that water is through on-farm conservation in the lower three counties. Through the HB 1437 process, farmers within LCRA's irrigation divisions will receive funding of about 80 percent of the total costs, with farmers bearing 20 percent of the cost for implementing conservation.

Table 5.127: Summary of Recommended Water Management Strategies to Meet Irrigation Needs in Colorado, Matagorda, and Wharton Counties

Water Management Strategies	2020 Needs	2030 Needs	2040 Needs	2050 Needs	2060 Needs	2070 Needs
	(252,627)	(238,185)	(224,132)	(210,456)	(197,149)	(184,201)
	Water Management Strategy Yield (ac-ft/yr)					
Drought Management	34,004	33,088	32,199	31,333	30,491	29,671
On-Farm Conservation	22,054	26,464	30,874	35,286	39,698	44,108
Irrigation Operations Conveyance Improvements	6,000	13,670	21,341	29,011	36,680	44,350
Sprinkler Irrigation	912	4,558	9,114	11,394	11,394	11,394
Real-Time Use Metering and Monitoring	20,509	19,955	19,420	18,897	18,389	17,895
Return Flows	17,006	16,765	16,526	16,287	16,047	15,809
Development and Expansion of Groundwater Supplies	14,460	14,460	14,460	14,460	14,460	14,460
LCRA WMP Interruptible Water (2010 WMP)	63,495	25,797	13,105	0	0	0
(Future LCRA WMP, including OCR supplies)	*	*	*	*	*	*
Remaining Shortage/Surplus	**(74,187)**	**(83,428)**	**(67,093)**	**(53,788)**	**(29,990)**	**(6,514)**

* Availability of interruptible water will be increased using recommended OCRs; the estimated quantity is subject to WMP amendments through TCEQ and the hydrologic outcome of the current drought.

After the recommended strategies, there are remaining unmet needs for Irrigation in Colorado, Matagorda, and Wharton counties for the 2021 Region K Plan. The remaining needs shown in Table 5.127 incorporate surpluses that occur in some counties/basins.

5.2.7 Manufacturing Water Management Strategies

Development of new groundwater supplies was identified to meet manufacturing WUG needs in Fayette County. The following regional water management strategy was selected to meet Manufacturing needs:

- Development of New Groundwater Supplies (Discussed in *Section 5.2.4.2.7*)

5.2.8 Mining Water Management Strategies

The following regional water management strategies were selected to meet Mining needs:

- Mining Conservation (Discussed in *Section 5.2.2.4*)
- Expanded Local Use of Groundwater (Discussed in *Section 5.2.4.1.3*, *Section 5.2.4.1.6*, *Section 5.2.4.1.7*)
- Development of New Groundwater Supplies (Discussed in *Section 5.2.4.2.1*, *Section 5.2.4.2.3*, *Section 5.2.4.2.4*)

- Water Purchase (Discussed in *Section 5.2.4.6*)

There is also identified unmet Mining needs in the 2021 Region K Plan. These needs were identified in Bastrop County in coordination with Region G. The mining industry in that area pumps groundwater to lower the water table in order to allow access to mining activities. It was determined that the Mining demands were not true demands, and therefore did not need to have recommended water management strategies. The unmet Mining WUG needs are as follows:

Table 5.128: Unmet Mining Needs in Region K

WUG	County	Basin	Unmet Needs (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Bastrop	Colorado	(449)	(3,947)	(4,557)	(3,220)	0	0

5.2.9 Steam-Electric Power Water Management Strategies

Steam-electric needs in the region include those for Austin in Fayette County and STPNOC in Matagorda County. While the 2021 Region K Water Plan does show Steam-electric water needs in Colorado County of 4,743 ac-ft/yr for every decade, these are based on demand projections included in *Chapter 2* that have been determined not to exist. One of the steam-electric facilities that the demands are based on currently does not exist and has no plans for construction. The other facility does exist but has no consumptive demands. Therefore, the water needs identified for this planning cycle for the Steam-electric WUG in Colorado County are not real and the LCRWPG has not developed strategies to meet them. The following sections discuss the recommended strategies for meeting the Steam-Electric water needs.

5.2.9.1 Austin Steam-Electric Water Management Strategies

Austin has steam-electric power demands in Fayette, Matagorda, and Travis Counties. Austin's portion of the South Texas Project (STP) demand is included in the STP total steam-electric demand in Matagorda County, and is therefore not addressed here. The table below shows the steam-electric water demands in Fayette and Travis Counties.

Table 5.129: Austin Steam-Electric Power Water Demands

Category Name	Water Demands (ac-ft/yr)					
	2020	2030	2040	2050	2060	2070
Fayette (Austin's portion)	10,300	10,300	10,300	10,300	10,300	10,300
Travis	10,253	10,253	10,253	10,253	10,253	10,253

To meet Austin's steam electric power needs, Austin has identified two main water management strategies in addition to current supplies. These are use of water released from the LCRA Contract Amendment (*Section 5.2.3.1.3*) and Centralized Direct Non-Potable Reuse (*Section 5.2.3.2.7)*. These are summarized in the following table showing the steam- electric supplies and water management strategies in Fayette and Travis counties.

Table 5.130: Austin Steam-Electric Supplies and Water Management Strategies (ac-ft/yr)

Austin Supplies & Strategies	2020	2030	2040	2050	2060	2070
Fayette County Supplies						
LCRA Purchase – Highland Lakes/Reservoir System	7,016	7,016	7,016	7,016	7,016	7,016
Fayette County Strategies						
LCRA Contract Amendment – Steam-Electric (COA)	4,300	4,300	4,300	4,300	4,300	4,300
Fayette Total	**11,316**	**11,316**	**11,316**	**11,316**	**11,316**	**11,316**
Travis County Supplies						
LCRA Purchase – Highland Lakes/Reservoir System	5,153	5,153	5,153	5,153	5,153	5,153
Run-of-River Right 5471	9,240	9,240	9,240	9,240	9,240	9,240
Travis County Strategies						
Direct Reuse – Steam-Electric	0	1,750	1,750	1,750	1,750	1,750
Travis Total	**14,393**	**16,143**	**16,143**	**16,143**	**16,143**	**16,143**

It is anticipated that there will be additional infrastructure needed. The probable costs associated with Austin's direct reuse water management strategy for supplying steam electric needs in Travis County are estimated to be approximately $995/ac-ft (as shown in the Austin Centralized Direct Non-Potable Reuse section of this chapter). Costs to amend Austin Energy's contract with LCRA are shown at $145/ac-ft and are included in the LCRA Contract Amendment section of this chapter.

5.2.9.2 STP Nuclear Operating Company Water Management Strategies

The South Texas Project Electric Generating Station (STP) is a nuclear power facility located southwest of Bay City, in Matagorda County. The facility's demand is based on higher availability of generation capacity, added generating capacity, and blowdown of the reservoir to maintain water quality. This demand during the 50-year planning horizon will be satisfied significantly through (1) the management strategies of continued run-of-the-river diversions of up to 102,000 ac-ft/yr, under Certificate of Adjudication No. 14-5437[9], (2) continued use of STPNOC's existing off-channel reservoirs authorized under Certificate of Adjudication No. 14-5437; and (3) continued pumpage of groundwater for the purposes of incorporation in STPNOC's processes. Supplementing its run-of-the-river diversions, STPNOC also has a contract with LCRA for firm backup water of 20,000 acre-feet for 2-unit operation and 40,000 acre-feet for additional generating units, for so long as electric generation facilities are operated at the site.

Based on current projections completed for the 2021 Region K Plan, shortages of approximately 11,300 ac-ft/yr have been identified commencing as early as 2020 for Steam-Electric supplies in Matagorda County during a repeat of the DOR. It is of additional note that STPNOC's diversions to their reservoir can be affected by water quality at the STPNOC diversion point. In order to support a long-term reliable electric

[9] STPNOC's interest in the water rights evidenced in the certificate are as agent for the STPNOC owners, the City of San Antonio acting through the City Public Service Board, COA, and NRG South Texas, LP.

supply for Texas, alternative strategies have been identified for offsetting these shortages and to guard against the continuing escalation in upstream demands which may affect water quality at the current permitted diversion point near the plant, although the recent amendment to the water right to allow diversion upstream of the LCRA Bay City dam may provide some ability to mitigate any water quality impacts.

STPNOC and LCRA negotiated an extension and amendment to the water supply contract in 2006, which helps ensure a long-term, cost effective water supply for the STP plant. Additional and alternative strategies include but are not limited to the following:

- Blend brackish surface water in STPNOC reservoir
- Alternate canal delivery
- LCRA contract amendment
- Water right permit amendment
- Dedication of return flows from other users

Conservation also is an integral part of STPNOC's operational philosophy as documented in the Water Conservation Plan filed with the TCEQ.

5.2.9.2.1. Blend Brackish Surface Water in STPNOC Reservoir

During an emergency situation, when the STPNOC reservoir reaches 30 feet mean sea level (MSL), STPNOC and LCRA will pursue relief from the TCEQ to be allowed to pump brackish surface water to blend in with the existing fresh water in the STPNOC reservoir. A firm yield of 3,000 ac-ft was determined for each decade in the planning period. This strategy has no cost associated with it, no environmental impacts, and no impacts to agriculture.

5.2.9.2.2. Alternate Canal Delivery

The STP facility currently has run-of-river rights and withdraws cooling water directly from the Lower Colorado River. However, the existing diversion point is very close to Matagorda Bay, which means it is mixed with high salinity water from the bay.

For this strategy, water would be withdrawn from the Lower Colorado River, upstream of the Bay City Dam, and transported to the cooling water reservoir adjacent to the STP. The water pulled upstream of the dam would be better quality (less saline) than the water withdrawn from the existing diversion point. STP's current contract allows diversion from this point, but currently there are no physical means in place to facilitate this. The source of the water is the same as the current source: flows from the Colorado River.

The infrastructure required to implement this strategy includes:

- Existing LCRA pump station and irrigation canals, to transport the water through the canals as close as possible to the existing cooling water reservoir
- New pipeline to transport the water from the irrigation canals to the cooling water reservoir

STP would have to pay LCRA for the use of their pump station and irrigation canal. The estimated cost is approximately $120-150/ac-ft. In addition, there may be an existing regulatory issue with using the existing pump station for this strategy. Any regulatory issues would need to be resolved prior to implementing this strategy.

Since the existing irrigation canals are fairly close to the existing reservoir, the pipeline length to convey water from the canals to the reservoir is expected to be relatively short. For the purposes of this report, the length is assumed to be 1,000 feet.

The yield from this strategy is projected to be 12,727 ac-ft/yr. This is based on continuous pumping of 32,000 gallons per minute over only the winter months out of the year. This duration is assumed at 90 days. This will only make up a small percentage of the currently permitted 102,000 ac-ft/yr, so the majority of the volume is still expected to come from the existing diversion point. There are no plans to increase the permitted amount at the time of this report. The project yield from this strategy is shown in the following table.

Table 5.131: STP Alternate Canal Delivery Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Steam-Electric	Matagorda	Colorado	0	12,727	12,727	12,727	12,727	12,727

Cost Implications of Proposed Strategy

Costs for this strategy were developed based on background information provided by STP, and the Texas Water Development Board (TWDB) Cost Estimating Tool. Consistent with the tool, all costs are given in September 2018 dollars. Costs shown assume a cost of $135/ac-ft for use of the LCRA pump station and irrigation canal.

The following table shows the estimated costs associated with this strategy.

Table 5.132: STP Alternate Canal Delivery Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Steam-Electric	Matagorda	Colorado	$4,436,000	$6,158,000	$2,326,000	$183

Environmental Considerations

Minimal environmental impacts are expected as a result of implementing this strategy, since the same amount of water is being withdrawn, only at a different point. The only potential impact would be to environmental uses between the new withdrawal point (Bay City Dam) and the existing withdrawal point. However, withdrawal could be managed to meet any environmental flows first, before withdrawing from the new withdrawal point. If additional flow is still required, it could be taken from the existing withdrawal point. Thus, environmental impacts should be negligible.

Refer to *Chapter 1, Appendix 1A*, for the complete list by County of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

Negligible impacts to agriculture or natural resources are expected as a result of implementing this strategy since the diversion is planned for the winter months (non-irrigation season).

5.2.9.2.3. LCRA Contract Amendment

An additional contract amendment for 8,300 ac-ft/yr with LCRA for the 2020 planning decade is another way to meet STP needs. LCRA projects such as the off-channel reservoirs are ways to increase LCRA's supply to meet these increased demands for new firm contracts and contract amendments. This strategy is described in *Section 5.2.3.1.4*, LCRA Contract Amendments.

5.2.9.2.4. Water Right Permit Amendment

A joint application (14-5437C) between STP and LCRA was filed in 2010 with TCEQ. The application is to amend the water right to allow an average diversion of 102,000 ac-ft over any five consecutive years with a single year cap not to exceed 245,000 ac-ft. There is no impact to existing water rights. There is no additional yield, no costs, and no impacts associated with this permit amendment. The joint application was filed with TCEQ in 2010 and is under "technical review."

5.2.9.2.5. Return Flows from Other Users

STP benefits from return flows sent downstream from upper basin users such as Austin. See *Section 5.2.1.1* for more information regarding Austin return flows and the benefits associated with the return flows.

5.3 ALTERNATIVE WATER MANAGEMENT STRATEGIES

LCRA is looking at several options to help meet future needs in the decades to come and would like to include some of the potential strategies as alternative strategies while the evaluation process continues. In addition, an expanded local use of groundwater strategy provides water exceeding the MAG.

5.3.1 Alternative Strategies for LCRA Major Water Supply

This section contains alternative new water supply options for LCRA. This water would provide additional firm yield to LCRA as a major water provider and could be used to meet various needs throughout Region K.

Table 5.133: LCRA Major Water Supply Alternative Water Management Strategy Yield

LCRA Alternative Strategy	Water Management Strategies (ac-ft/yr)					
	2020	2030	2040	2050	2060	2070
Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)	0	25,000	25,000	25,000	25,000	25,000
Brackish Groundwater Desalination	0	0	22,400	22,400	22,400	22,400
Supplement Bay and Estuary Inflows with Brackish Groundwater	0	12,000	12,000	12,000	12,000	12,000

5.3.1.1 Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)

LCRA plans to continue expanding its use of groundwater sources to meet future demands. LCRA currently holds groundwater permits from the Lost Pines Groundwater Conservation District for production wells in the Carrizo-Wilcox Aquifer in Bastrop County and has filed applications for permits to develop up to 25,000 ac-ft/yr of additional groundwater in Bastrop County for municipal, industrial, and other beneficial uses. The alternative strategy was assumed to be implemented in 2030.

A preliminary analysis from LCRA indicated that a well field would be located on the Griffith League Ranch in central Bastrop County. The groundwater is anticipated for use in Bastrop County, but could also potentially be used in Travis County.

Whereas the recommended strategy for expanded use of the Carrizo-Wilcox Aquifer for LCRA allocates water available under the Modeled Available Groundwater (MAG), this alternative version exceeds the amount available under the MAG when considering other permitted pumping. The groundwater source for this strategy will be the Carrizo-Wilcox Aquifer in Bastrop County.

The following infrastructure would be required for this strategy:

- Eight (8) 2,600 gpm Water Supply Wells and well transmission piping
- Approximately 4.5 miles of raw water transmission piping and appurtenances
- Primary Pump Station

A peaking factor of one (1) was assumed. A peak flow per well of 2,600 gpm was determined in the costing tool based on a total of eight wells. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node.

Cost Implications of Proposed Strategy

Costs were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool in September 2018 dollars. The Cost Estimating Tool was also used to determine operating costs.

Per the Lost Pines Groundwater Conservation District, a $11.40/ac-ft production fee was assumed.

The capital cost for this strategy is primarily driven by the cost of the well field and transmission pipeline. Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool. The following table shows the estimated costs associated with this strategy.

Table 5.134: Alternative LCRA Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer) Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$27,239,000	$38,139,000	$4,740,000	$190

Environmental Considerations

The water supply for this strategy exceeds the Modeled Available Groundwater (MAG), so drawdown in the aquifer could contribute to a drawdown of more than 240 feet in the aquifer by 2070, relative to January 2000 conditions.

The project is subject to requirements of the LCRA's Incidental Take Permit and Habitat Conservation Plan and associated requirements of the U.S. Fish and Wildlife Service. In addition, there are several endangered or threatened species that may need to be taken into consideration during design. *Appendix 1A* in *Chapter 1* provides a list of rare, threatened, and endangered species by county. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

There are no direct impacts to agriculture or natural resources anticipated from this strategy; however, the additional drawdown of the aquifer has the potential to impact agriculture by creating the need to lower pumps, re-drill wells, and pay for additional electricity for pumping.

5.3.1.2 Brackish Groundwater Desalination from the Gulf Coast Aquifer

This strategy includes the extraction of brackish groundwater from the Gulf Coast Aquifer in Matagorda County, its treatment using reverse osmosis (RO), and the delivery of approximately 22,400 ac-ft/yr (20 mgd) of potable water to Bay City area for municipal and industrial use, beginning in the 2040 decade. The RO permeate (waste generated in the RO process) would be disposed of directly into the ground via a deep injection wellfield. Brackish Groundwater Desalination is suggested as an alternative strategy rather than a recommended strategy because it exceeds available resources, as identified in the regional water planning process.

Cost Implications of Proposed Strategy

Costs for this strategy were developed using the Texas Water Development Board (TWDB) Cost Estimating Tool, based on infrastructure described in the LCRA 2009 Water Supply Resource Plan. Consistent with the tool, all costs are given in September 2018 dollars. The following table shows the estimated costs associated with this strategy.

Infrastructure associated with this strategy include:

- 25 MGD reverse osmosis treatment plant
- Fifteen (15) miles of 36-inch transmission pipe to supply treated water to Bay City area
- 2.86 miles of 12-inch RO permeate line

- Extraction wellfield with 14 wells
- Deep injection wellfield for disposal of RO permeate with 6 wells
- 2 MG ground storage tank
- High service pump station

Table 5.135: Alternative LCRA Brackish Groundwater Desalination Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$165,047,000	$229,006,000	$31,199,000	$1,393

Environmental Considerations

The Matagorda Bay region includes a significant amount of acreage designated as wetlands, which serve as the habitat for numerous terrestrial and marine species, some of which are threatened and/or endangered. Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Some additional potential environmental impacts would be related to the potential degradation of the quality of the groundwater in the vicinity of the proposed wells, and the management of the RO waste and byproducts such as concentrated salt solution. The current groundwater availability models do not include quality information or capability to model changes in water quality. For that reason, it is not possible to determine whether the flows being pumped will impact the overall quality of the aquifer in this area. Management of the concentrated salt solution by deep well injection should adequately confine the materials within deep aquifers with similar salt concentrations to minimize any negative impacts.

Currently, the Modeled Available Groundwater (MAG) does not distinguish between fresh water and brackish water in the Gulf Coast Aquifer. As such, exceeding the MAG long-term would likely contribute to exceedance of the Desired Future Conditions, which is no more than 13 feet of average drawdown by 2069, relative to January 2000 conditions.

Agricultural & Natural Resources Considerations

This strategy does not put increased demand on water supplies already being used by agriculture and does not move supply from agricultural uses to other usage. To the extent that the supplies would be used to offset a demand that may otherwise need to be met with Colorado River water, and depending on when those demands materialize, it is possible that incorporation of these supplies into LCRA's system will allow additional interruptible water of somewhere between 0 ac-ft/yr and 22,400 ac-ft/yr to be made available for agricultural purposes (variables do not allow for a 1:1 ratio).

5.3.1.3 Supplement Bay & Estuary Inflows with Brackish Groundwater

Brackish groundwater delivery to the Matagorda Bay Estuary System is considered as a potential water management strategy for the LCRA (major water provider) to offset required releases from the Highland Lakes. By developing a new source to meet environmental needs, the firm supply that would otherwise be released from the Highland Lakes to meet bay and estuary inflow requirements can remain in the Highland Lakes and become a firm supply for LCRA's existing and future customers. Equivalence of brackish groundwater to achieve the same effect as a volume of water released from the Highland Lakes would be a function of the brackish groundwater total dissolved solids (TDS) values, the effectiveness of delivery directly to the lower marsh versus through the channel, and the amount of released water that reaches the Bay.

As part of its plan for growth, LCRA is considering brackish groundwater delivery for Bay & Estuary needs as a potential water source strategy in the 2021 Regional Water Plan. The strategy would consist of:

- Obtaining a permit from Coastal Plains GCD
- Developing a well field in the Matagorda Bay Delta (Gulf Coast Aquifer, Matagorda Bay, Colorado Basin) with associated piping for discharge into the lower marsh

A preliminary project concept sizes the well field supply with a capacity of 12,000 ac-ft/yr. A peak pumping capacity of 3,150 ac ft per month could be potentially feasible, depending on results of future studies. The infrastructure required for this strategy consists of:

- Twelve (12) brackish stainless-steel groundwater wells, depths up to 1,200 ft
- Simple Outfall Structure

The project yield is estimated to be 12,000 ac-ft/yr for decades 2030-2070. Because this volume of groundwater exceeds the Modeled Available Groundwater (MAG), which does not distinguish between fresh water and brackish water, this strategy can only be included in the 2021 Region K Plan as an alternative strategy, rather than a recommended strategy.

Cost Implications of Proposed Strategy

A project cost estimate was provided by LCRA in May 2014 dollars. Costs from the provided estimate were adjusted to September 2018 dollars via ENR CCI indices and input into the Texas Water Development Board (TWDB) Cost Estimating Tool.

Note that the cost of engineering, legal costs, contingency, mobilization, annual well pump replacement, and annual lease fee were not calculated via the TWDB costing tool, but provided from the referenced May 2014 LCRA costs, adjusted to September 2018 dollars.

The capital cost for this strategy is primarily driven by the cost of the well fields. The following table shows the estimated costs associated with this strategy.

Table 5.136: Alternative LCRA Supplement Bay & Estuary Inflows with Brackish Groundwater Cost

Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
$26,073,000	$47,269,000	$6,381,000	$532

Environmental Considerations

Timing and location of delivery of brackish groundwater could have equal or possibly more effective impacts to the bay than releases from Highland Lakes' storage. Modeling and potential pilot testing would be necessary to determine effects of incoming salinity and delivery location. Instream flows would possibly be reduced by up to 12,000 ac-ft/yr as a result of not releasing stored water.

Refer to *Chapter 1, Appendix 1A*, for the complete list by county of threatened and endangered species in the Lower Colorado Regional Water Planning Area. These species may need to be considered during construction of infrastructure.

Agricultural & Natural Resources Considerations

This strategy could be used by LCRA to help meet environmental needs that would otherwise be met from stored water releases from the Highland Lakes, potentially increasing availability of interruptible water supply by up to 12,000 ac-ft/yr.

5.3.2 Other Alternative Water Management Strategies

The following strategy is included in the 2021 Region K Water Plan as an alternative strategy for Aqua WSC.

5.3.2.1 Expanded Local Use of Groundwater – Carrizo-Wilcox Aquifer

This alternative strategy would involve pumping additional groundwater from the Carrizo-Wilcox Aquifer through the drilling of additional wells in order to supply the Aqua WSC WUG. Whereas the recommended strategy for expanded use of the Carrizo-Wilcox Aquifer allocates water available under the Modeled Available Groundwater (MAG), this alternative version exceeds the MAG in order to meet the total need for Aqua WSC after implementation of drought management and conservation, which totals 19,121 ac-ft/yr by 2070.

Table 5.137 presents the WUGs that would utilize this strategy along with the implementation decade and the amount of water to be pumped.

Table 5.137: Alternative Carrizo-Wilcox Aquifer Expansion Yield

WUG	County	Basin	Water Management Strategies (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Aqua WSC	Bastrop	Brazos (to Colorado)	0	0	0	0	0	5,736
Aqua WSC	Bastrop	Colorado	0	5,500	5,500	5,500	13,385	13,385

This strategy was applied to Aqua WSC in Bastrop County in the Colorado River Basin. While the need for Aqua WSC is located in the Colorado basin, this strategy supplies the Aqua WSC system with groundwater from both the Brazos and Colorado basins.

Cost Implications of Proposed Strategy

Table 5.138 presents a summary of the probable costs for each WUG utilizing this strategy. The four cost components analyzed during cost estimation of this strategy were: Total Facilities Cost, Total Project Cost, Annual Cost, and Unit Cost.

The costs of the groundwater supply strategy were estimated using the Texas Water Development Board (TWDB) Cost Estimating Tool. The number of new wells was determined in the Cost Estimating Tool, based on the largest quantity of water supplied over the planning period. Wells were all assumed to be the same type, size, at the same elevation, and to have an efficiency of 80%. The well field layout was determined by two wells per "node," a 0.5-mile transmission line between each well and its node, and an additional 0.5 mile "trunk" line connecting to the next node. One mile of transmission piping to connect each wellfield to the distribution system was assumed. A peaking factor of two (2) was assumed (twice the largest quantity of water supplied). Assumptions of well capacity and depth were made by reviewing historical well data for wells located in proximity to each WUG. Historical data was obtained using the Texas Water Development Board Groundwater Database's well search and water level search functions.

Because water is supplied to Aqua WSC by two river basins through this strategy, two separate well fields are assumed, one for each basin. The costs for each basin have been combined for this analysis. A greater portion of wells are assumed to draw from the Colorado Basin allocation, as it covers the majority of Bastrop County.

Additional capital costs including engineering, legal services, contingencies, environmental and archeology studies and mitigation, land acquisition and surveying, and interest during construction were estimated using the Cost Estimating Tool. Annual costs including debt service, operation and maintenance, and pumping energy costs were also estimated using the tool.

Table 5.138: Alternative Carrizo-Wilcox Aquifer Expansion Cost

WUG	County	Basin	Total Facilities Cost	Total Project Cost	Largest Annual Cost	Unit Cost ($/ac-ft)
Aqua WSC	Bastrop	Brazos, Colorado	$26,836,000	$37,682,000	$4,220,000	$221

Environmental Considerations

The environmental impacts of expanded groundwater use will vary depending upon site characteristics. Some impacts may occur from the expansion of existing groundwater infrastructure, but well sites are generally small in areal extent, and the disturbance from pipeline construction is temporary. The water supply is beyond the Modeled Available Groundwater (MAG), so this strategy could contribute to drawdown in the aquifer in excess of 240 feet by 2070, relative to January 2000 conditions.

5.4 CONSIDERED, BUT NOT RECOMMENDED OR ALTERNATIVE STRATEGIES

The TWDB rules require the RWPG to evaluate all potentially feasible water management strategies to meet the Region's identified demand deficits. Feasibility is based on evaluation criteria established by the TWDB and the RWPG including project cost, unit cost, yield, reliability, environmental impact, local preference, and institutional constraints. Several water management strategies were identified and evaluated, but after initial evaluation, were determined by the RWPG or in some cases the potential project sponsor to not be suitable for consideration at this time or the project sponsor decided to no longer include them. These strategies are discussed in the following sections.

5.4.1 Tail Water Recovery

Tail water recovery is defined by the Natural Resources Conservation Service (NRCS) as a planned irrigation system in which facilities utilized for the collection, storage, and transportation of irrigation tail water and/or rainfall runoff for reuse have been installed. The system allows for the capture of a portion of the irrigation field return flows, stores them until needed, and then conveys the water from the storage facility to a point of entry back into the irrigation system.

This strategy was evaluated under the Irrigation Conservation strategy, but the LCRWPG determined the strategy to not be feasible, since other strategies reduce the amount of tail water to be recovered.

5.4.2 Reservoir Capacity Expansion

Reservoir capacity expansion involves increasing storage capacity so that water may be more readily available for use. During times of drought, the Llano Water User Group (WUG) installs a flashboard system downstream along the Llano River Lake, an on-channel reservoir. Llano is also considering the installation of additional flashboards upstream along the dam of Llano Park Lake. Flashboards, which consist of individual wooden boards or structural panels anchored to the crest of a dam, can be used as means of raising the reservoir storage level above a fixed spillway crest level. In addition to increased storage capacity, the additional water depth provided by flashboards reduces the sedimentation rate, allowing for a higher quality of water to be pumped at the reservoir's water supply intake. Flashboards are a temporary measure, as they can only be used during low inflow periods; they must either be removed before floods occur or designed to safely fail automatically.

This strategy was modeled using the strategy version of the Region K Cutoff Model and was shown not to increase yields in drought-of-record conditions under regional water planning guidelines. As such, this particular strategy cannot be recommended in the 2021 Region K Water Plan but can be included as a considered strategy. The strategy was requested for inclusion in the 2021 RWP to accurately reflect Llano's water situation.

Reservoir capacity expansion is also a component of the Goldthwaite Water Supply strategy, referenced below.

5.4.3 Goldthwaite Water Supply

Goldthwaite Water User Group (WUG) is developing a multi-step water supply strategy involving water permit acquisition and amendments, reservoir development, and reuse. Though this strategy does not provide water under drought-of-record conditions, it was requested for inclusion in the 2021 RWP to accurately reflect the WUG's water situation. Due to limited information available, this strategy can be classified as considered, but not as recommended or alternative.

Goldthwaite obtained diversion rights to 1,000 ac-ft/yr of irrigation water under certificate of adjudication (COA) 14-2546, for which they are requesting an amendment to allow municipal and industrial usage. This amendment would also: 1) sever this diversion amount from 14-2546 and add it to current COA 14-2553A;

2) move the diversion point downstream to the same location at 14-2553A; and 3) revise the number of authorized off-channel reservoirs as well as the capacity of those reservoirs.

Under current COA 14-2553A, Goldthwaite has 1,500 ac-ft/yr water rights on the Colorado River with three (3) reservoirs permitted with a storage capacity of 315 ac-ft. The permit amendment would allow for the addition of a fourth off-channel reservoir and increasing the total permitted storage capacity to 650 ac-ft capacity.

Goldthwaite currently has the ability to reuse 250 ac-ft/yr wastewater for irrigation purposes. With the amendment, language changes will permit Goldthwaite to reuse all diverted water, though there are no specific plans in development regarding expansion of reuse.

5.4.4 Groundwater Importation – Carrizo-Wilcox to LCRA System

As part of their Water Supply Resource Plan, the LCRA developed several alternative water supply options to meet future demands. These new water supply options would provide additional firm yield to LCRA as a regional water provider and could be used to meet various needs throughout Region K. This water supply strategy involved developing approximately 35,000 ac-ft of untreated groundwater from outside the Planning Area and Colorado River Basin and transporting the water to eastern Travis County, beginning in 2040. This water supply option would utilize groundwater produced from the Simsboro Formation of the Carrizo-Wilcox Aquifer in northern Burleson County. A pipeline with two booster pump stations would be required to convey the water to the conceptual delivery point in Travis County.

The well field was assumed to be located in Burleson County, with a delivery point in eastern Travis County at approximately State Highway 130 (SH130) and the Colorado River, but exact location of the well field and delivery point could depart from this assumption. The pipeline alignment conceptually followed SH21, FM 696, and US Highway 290 to its delivery point in the vicinity of SH130.

5.4.5 Groundwater Supply for FPP

LCRA and Austin jointly own the Fayette Power Project (FPP) in Fayette County. LCRA previously evaluated evaluating possible water supplies to augment LCRA's share of the surface water supply provided to the FPP cooling water reservoir (Cedar Creek Reservoir) used for process and cooling water. Currently, water at FPP is diverted from Cedar Creek Reservoir, and LCRA's share of water in Cedar Creek Reservoir comes from local inflows from Cedar Creek, and stored water released from the Highland Lakes.

Groundwater was considered another source of water to address surface water filtering concerns (algae) and help alleviate potential drought contingency plan cutbacks from the Colorado River. Water supply sources identified include groundwater both on- and off- the FPP property. Groundwater supplied on-property would come from the Oakville Sandstone and the Catahoula Tuff, which are part of the Gulf Coast Aquifer System. The preliminary analysis indicates that a groundwater well field could not be located near the FPP due to high levels of total dissolved solids (TDS). Groundwater off-property could be provided from the Carrizo-Wilcox Aquifer, from the Yegua-Jackson Aquifer, or from both in Fayette and/or Bastrop Counties.

5.4.6 Oceanwater Desalination

LCRA requested that this strategy be evaluated as part of the regional water planning process, but a project sponsor was not identified for the 2021 Region K Plan.

This strategy proposes to intake seawater directly from the Gulf of Mexico (the "Gulf") to deliver approximately 22,400 ac-ft/yr (20 MGD) to users in the Bay City area of Matagorda County. The proposed desalination process would divert 55 MGD directly from the Gulf near the Matagorda Bay, treat the water using reverse osmosis (RO) filtration, and deliver 20 MGD of treated water serve industrial users in and around Bay City. Approximately 25 MGD of RO permeate (reject water with high concentrations of dissolved solids) would then be delivered back to the Gulf through a direct diffuser pipe perpendicular to the coastline. Unit processes reduce the amount of water that can be delivered (e.g., some is removed with sludge, etc.), thus the sum of RO permeate and treated water (45 MGD) is less than the total intake water (55 MGD).

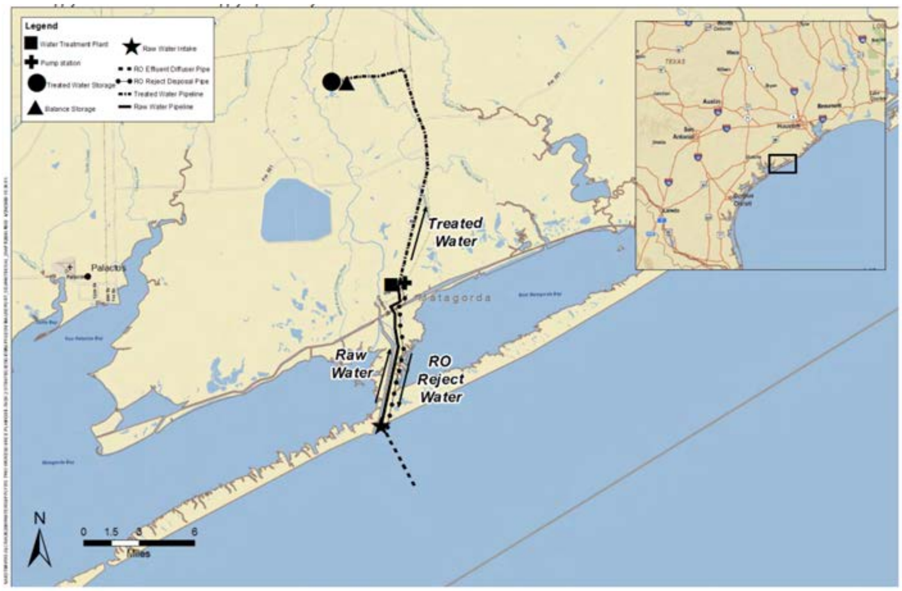
Infrastructure to be constructed as a part of this strategy includes:

- 55 MGD Intake pump station
- 8.15 miles of 48-inch raw water pipeline
- 2 MG raw water flow equalization basin
- 20 MGD reverse osmosis treatment plant
  (including raw water screening and intake pumps, flocculation, sedimentation, gravity thickening, first and second pass RO, ultrafiltration membranes, centrifuges, all chemical storage and feed systems, internal pumping facilities and storage, water storage, and an O&M building)
- 60 MG treated water storage facility (50' TDH)
- 15.7 miles of 36-inch treated water pipeline
- 25 MGD 8.15 miles of 36-inch RO permeate (reject water and desalination byproduct) return pipeline
- 0.5-mile sealed discharge pipeline extending from coastline into open waters, to avoid discharge near the coastline
- 3.8 miles of progressively smaller RO permeate discharge diffuser pipeline

The source water is characterized by a total dissolved solids (TDS) concentration of 35,000 mg/L or more, and desalination treatment processes for this strategy were sized based on this assumption. Extensive environmental studies and permitting are assumed to be required for the seawater intake and brine disposal structures.

The firm yield for this strategy is approximately 22,400 ac-ft/yr, with an assumed online decade of 2060. The yield by decade is reported in the table below. A schematic showing the strategy infrastructure is included below as an example of a potential generic project, taken from the *Water Supply Resource Plan: Water Supply Option Analysis (July 2009, CH2M Hill)*.

Figure 5.3: Oceanwater Desalination



Note this figure is schematic and was developed for the purpose of creating order of magnitude cost estimates.

The Matagorda Bay region includes a significant amount of acreage designated as wetlands, which serve as the habitat for numerous terrestrial and marine species, some of which are threatened and/or endangered. These species may need to be considered during construction of infrastructure. Additionally, the Big Boggy National Wildlife Refuge is nearby the proposed project area and must be avoided by the pipeline.

Environmental study and permitting will be needed to inform design and operation of the plant intake. Oceanwater desalination intake stations, especially surface-level intakes, are prone to entrainment of aquatic organisms and their propagules (eggs, larvae, and spores), which leads to organism mortality. While not currently proposed, indirect intakes located below the sea or beach floor, composed of wells or buried pipes, could greatly reduce the environmental impact of the intake.

Brine disposal also presents environmental impacts. The selected discharge method (ocean disposal) elevates salinity and reduces dissolved oxygen concentrations at the discharge location, which can lead to organism mortality. The proposed discharge pipeline is a 3.8-mile diffuser pipe, which may help disperse and mitigate the effects of elevated salinity levels.

5.5 DOCUMENTATION OF THE IDENTIFICATION AND EVALUATION PROCESS

The process that the Water Management Strategies Committee went through to identify and evaluate the potentially feasible water management strategies for this planning cycle is documented in the Water Management Strategies Committee meeting minutes included in *Appendix 5F*.

APPENDIX 5A

POTENTIALLY FEASIBLE WATER MANAGEMENT STRATEGIES

Table 5A-1: Region K Water Management Strategies Considered and Evaluated

Table 5A-2: Region K Potentially Feasible WMS Screening

Table 5A-1: Region K Water Management Strategies Considered and Evaluated

Every WUG Entity with an Identified Need		WMSs NAMED TO BE CONSIDERED BY STATUTE											ADDITIONAL WMSs NAMED TO BE CONSIDERED BY RULE								
Water User Group Name	Maximum Need 2020-2070 (af/yr)	Conservation	Drought Management	Reuse	Management of Existing Supplies	Development of large-scale marine seawater or brackish groundwater	Conjunctive Use	Acquisition of available existing supplies	Development of new supplies	Development of regional water supply or regional management of water supply facilities	Voluntary transfer of water (incl. regional water banks, sales, leases, options, subordination agreements, and financing agreements)	Emergency transfer of water under Section 11.139	System optimization, reallocation of reservoir storage to new uses, contracts, water marketing, enhancement of yield, improvement of water quality	New SW supply	New GW supply	Brush control; precipitation enhancement	Interbasin transfers of surface water	Aquifer storage and recovery	Cancellation of water rights	Rainwater harvesting	other
Aqua WSC	26,087	PF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Austin	8,770	PF	PF	PF	PF	PF	nPF	nPF	PF	nPF	PF	nPF	PF	PF	nPF	nPF	nPF	PF	nPF	PF	
Barton Creek WSC	586	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Bastrop	5,902	PF	PF	PF	nPF	nPF	nPF	nPF	PF	nPF	PF	nPF	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	
Bastrop County WCID 2	1,178	nPF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Bay City	198	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Bertram	394	PF	PF	nPF	nPF	nPF	nPF	PF	PF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	
Briarcliff	104	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Buda	4,839	PF	PF	PF	PF	PF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	
Corix Utilities Texas Inc	13	PF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Creedmoor-Maha WSC	757	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Dripping Springs WSC	4,819	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Elgin	2,853	PF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Garfield WSC	63	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Goldthwaite	18	PF	PF	nPF	nPF	nPF	nPF	PF	PF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	
Granite Shoals	222	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Hays	353	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Hays County WCID 1	80	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Hays County WCID 2	160	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Horseshoe Bay	940	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Hurst Creek MUD	12	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Johnson City	80	PF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Jonestown WSC	116	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Lakeway MUD	143	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Leander	3,281	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	
Llano	642	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Loop 360 WSC	236	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Manville WSC	1,696	nPF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	
Marble Falls	1,766	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Meadowlakes	285	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
North Austin MUD 1	802	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Northtown MUD	1,268	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Pflugerville	9,220	PF	PF	PF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Rollingwood	377	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Schulenburg	118	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Senna Hills MUD	304	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Smithville	1,348	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Sunset Valley	713	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	PF	nPF	nPF	nPF	PF	nPF	nPF	PF	nPF	nPF	
Travis County MUD 10	28	nPF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	
Travis County MUD 14	49	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Travis County WCID 10	5,026	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	

Table 5A-1: Region K Water Management Strategies Considered and Evaluated

Every WUG Entity with an Identified Need		WMSs NAMED TO BE CONSIDERED BY STATUTE											ADDITIONAL WMSs NAMED TO BE CONSIDERED BY RULE								
Water User Group Name	Maximum Need 2020-2070 (af/yr)	Conservation	Drought Management	Reuse	Management of Existing Supplies	Development of large-scale marine seawater or brackish groundwater	Conjunctive Use	Acquisition of available existing supplies	Development of new supplies	Development of regional water supply or regional management of water supply facilities	Voluntary transfer of water (incl. regional water banks, sales, leases, options, subordination agreements, and financing agreements)	Emergency transfer of water under Section 11.139	System optimization, reallocation of reservoir storage to new uses, contracts, water marketing, enhancement of yield, improvement of water quality	New SW supply	New GW supply	Brush control; precipitation enhancement	Interbasin transfers of surface water	Aquifer storage and recovery	Cancellation of water rights	Rainwater harvesting	other
Travis County WCID 17	*1,836*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Travis County WCID 18	*379*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Travis County WCID Point Venture	*339*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Wells Branch MUD	*1,397*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
West Travis County Public Utility Agency	*10,966*	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	PF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Wharton	*87*	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Windermere Utility	*1,462*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
County-Other, Burnet	*162*	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	PF	PF	nPF	nPF	PF	nPF	PF	nPF	nPF	nPF	nPF	
County-Other, Colorado	*195*	nPF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
County-Other, Fayette	*789*	nPF	PF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
County-Other, Hays	*801*	nPF	PF	nPF	nPF	PF	nPF	PF	PF	PF	nPF	nPF	nPF	nPF	PF	PF	nPF	PF	nPF	nPF	
County-Other, Wharton	*155*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Irrigation, Colorado	*54,318*	PF	PF	nPF	nPF	nPF	nPF	PF	PF	PF	nPF	nPF	PF	PF	nPF	nPF	nPF	PF	nPF	nPF	
Irrigation, Matagorda	*123,222*	PF	PF	nPF	nPF	nPF	nPF	PF	PF	PF	nPF	nPF	PF	PF	nPF	nPF	nPF	PF	nPF	nPF	
Irrigation, Mills	*1,737*	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Irrigation, Wharton	*75,087*	PF	PF	nPF	nPF	nPF	nPF	PF	PF	PF	nPF	nPF	PF	PF	nPF	nPF	nPF	PF	nPF	nPF	
Manufacturing, Fayette	*40*	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Mining, Bastrop	*4,865*	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Mining, Burnet	*5,281*	PF	nPF	nPF	nPF	nPF	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Mining, Fayette	*760*	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Mining, Hays	*1,579*	nPF	nPF	nPF	nPF	nPF	nPF	PF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	
Steam-Electric, Colorado	*4,971*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Steam-Electric, Fayette	*4,299*	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Steam-Electric, Matagorda	*11,276*	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	

nPF = considered but determined 'not potentially feasible' (may include WMSs that were initially identified as potentially feasible)

PF = considered 'potentially feasible' and therefore evaluated

(all WMS evaluations shall be presented in the regional water plan including for WMSs considered potentially feasible but not recommended)

WUGs WITH NEED (REGION K NOT PRIMARY)																					
Brookesmith SUD	*1*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Canyon Lake Water Service	*2*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Cedar Park	*666*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	
Goforth SUD	*419*	PF	PF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	nPF	

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1))												Total of Screening Factors
										Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	
1	**Oceanwater Desalination**	0_N/A	Desalination of seawater from the Gulf of Mexico via reverse osmosis	No	$3,530	22,400	2060	N/A	N/A	-1	0	0	-1	-1	0	-1	0	0	0	0	0	-4
2	**Drought Management**	AQUA WSC	Mandatory water use reduction by 20%	Yes	$66	7,448	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
3	**Conservation**	AQUA WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,230	464	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
4	**Expand Local Use of Groundwater**	AQUA WSC	Expand use of Carrizo-Wilcox aquifer by developing wellfield in Brazos Basin of Bastrop County	Yes	$1,001	800	2030	Colorado	Yes	0	-1	-1	0	0	1	1	0	0	0	0	0	0
5	**Expand Local Use of Groundwater**	AQUA WSC	Expand use of Carrizo-Wilcox aquifer by developing wellfield in Colorado Basin of Bastrop County	Yes	$1,001	200	2030	Colorado	No	0	-1	1	0	0	1	1	0	0	0	0	0	2
6	**Alternative - Expand Local Use of Groundwater**	AQUA WSC	Expand use of Carrizo-Wilcox aquifer by developing wellfield in Brazos Basin of Bastrop County	Yes	$221	5,736	2070	Colorado	Yes	1	1	-1	0	0	1	-1	0	-1	0	0	-1	-1
7	**Alternative - Expand Local Use of Groundwater**	AQUA WSC	Expand use of Carrizo-Wilcox aquifer by developing wellfield in Colorado Basin of Bastrop County	Yes	$221	13,385	2030	Colorado	No	1	1	1	0	0	1	-1	0	-1	0	0	-4	-2
8	**New LCRA Contract (with infrastructure)**	AQUA WSC	Purchase SW through contract and construct new SWTP and transmission line from Colorado River	Yes	$914	20,000	2040	Colorado	No	0	1	1	0	0	0	-1	0	0	0	-1	0	0
9	**Drought Management**	AUSTIN	Mandatory water use reduction by 5%	Yes	$66	14,666	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
10	**Austin Conservation**	AUSTIN	Reduction in both per capita consumption and peak day to average day demand ratio	Yes	$1,343	40,620	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
11	**Austin Blackwater and Greywater Reuse**	AUSTIN	Decentralized small-scale reuse,	Yes	$0	9,290	2030	Colorado	No	1	1	1	1	1	0	0	0	1	-1	0	0	5
12	**Aquifer Storage and Recovery**	AUSTIN	Using treated effluent or surface water from the Colorado River is diverted to aquifer storage for later recovery	Yes	$2,234	15,800	2040	Colorado	No	-1	1	0	0	0	0	-1	0	0	0	0	0	-1
13	**Austin Off-Channel Reservoir and Evaporation Suppression**	AUSTIN	Construction of a new off-channel reservoir	Yes	$985	25,287	2070	Colorado	No	0	0	0	0	1	0	0	0	1	0	0	0	2
14	**Austin Onsite Rainwater and Stormwater Harvesting and Community Scale Stormwater Harvesting**	AUSTIN	Development of catchment areas to capture rainwater for potable or non-potable use.	Yes	$0	5,136	2030	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
15	**Austin Brackish Groundwater Desalination**	AUSTIN	Desalination of groundwater extracted from both the Trinity and the Saline Edwards aquifers.	Yes	$2,995	5,000	2070	Colorado	No	-1	1	0	0	-1	1	-1	0	1	0	0	0	0
16	**Austin Centralized Direct Non-Potable Reuse**	AUSTIN	Direct reuse of wastewater effluent for municipal and manufacturing purposes	Yes	$995	23,250	2020	Colorado	No	0	1	1	1	1	0	0	0	1	-1	0	0	4
17	**Austin Decentralized Direct Non-Potable Reuse**	AUSTIN	Direct reuse of community-scale wastewater effluent for municipal and manufacturing purposes	Yes	$48	16,680	2030	Colorado	No	1	1	1	1	1	0	0	0	1	0	0	0	6
18	**Capture Local Inflows to Lady Bird Lake**	AUSTIN	Install intake below Tom Miller Dam and pumping excess flows to the water treatment plant	Yes	$213	3,000	2040	Colorado	No	1	1	0	0	0	0	-1	0	0	0	0	0	1
19	**Longhorn Dam Operation Improvements**	AUSTIN	Increase Longhorn Dam's storage efficiency with projects including security upgrades, electrical updates, gate improvements, and data acquisition and monitoring improvements.	Yes	$393	3,000	2030	Colorado	No	1	1	0	0	0	0	0	0	0	0	0	0	2
20	**Indirect Potable Reuse through Lady Bird Lake**	AUSTIN	Conveying WWTP discharge to Lady Bird Lake and withdrawing water to be treated at the WTP	Yes	$457	20,000	2020	Colorado	No	1	1	0	-1	-1	0	-1	0	0	0	0	0	-1
21	**Lake Austin Operations**	AUSTIN	Would allow the lake to operate at a varying level instead of constant in order to capture local flows	Yes	$218	2,500	2020	Colorado	No	1	-1	0	0	0	0	0	0	0	0	-1	0	-1
22	**Drought Management**	BARTON CREEK WEST WSC	Mandatory water use reduction by 20%	No	$66	47	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
23	**Conservation**	BARTON CREEK WEST WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,077	193	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
24	**Drought Management**	BARTON CREEK WSC	Mandatory water use reduction by 25%	Yes	$66	121	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
25	**Conservation**	BARTON CREEK WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$470	409	2020	Colorado	No	1	0	1	0	0	0	0	0	1	0	0	0	3
26	**Water Purchase Amendment**	BARTON CREEK WSC	Water purchase amendment with Travis County MUD 4	Yes	$1,629	90	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
27	**Drought Management**	BASTROP	Mandatory water use reduction by 20%	Yes	$66	1,534	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
28	**Conservation**	BASTROP	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,972	992	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
29	**New LCRA Contract (with infrastructure)**	BASTROP	Purchase SW through contract and construct new SWTP and transmission line from Colorado River	Yes	$914	4,000	2050	Colorado	No	0	1	1	0	0	0	-1	0	0	0	-1	0	0
30	**Drought Management**	BASTROP COUNTY WCID 2	Mandatory water use reduction by 5%	Yes	$66	129	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

										Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1))													
	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
31	**New LCRA Contract (with infrastructure)**	BASTROP COUNTY WCID 2	Purchase SW through contract and construct new SWTP and transmission line from Colorado River	Yes	$914	1,500	2060	Colorado	No	0	1	1	0	0	0	-1	0	0	0	-1	0	0
32	**Drought Management**	BAY CITY	Mandatory water use reduction by 20%	Yes	$66	622	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
33	**Expand Local Use of Groundwater**	BAY CITY	Expand use of Gulf Coast aquifer in Brazos-Colorado Basin of Matagorda County	Yes	$53	75	2030	Brazos-Colorado	No	1	-1	1	0	0	1	0	0	0	0	0	0	2
34	**Drought Management**	BERTRAM	Mandatory water use reduction by 20%	Yes	$66	101	2020	Brazos	No	1	0	1	0	0	0	1	0	1	0	0	0	4
35	**Conservation**	BERTRAM	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,466	257	2020	Brazos	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
36	**Expand Local Use of Groundwater**	BERTRAM	Expand use of Ellenburger-San Saba aquifer in Colorado Basin of Burnet County. Pumping water from inactive quarry in Colorado Basin for storage and use in Bertram in the Brazos Basin.	Yes	$1,235	2,000	2030	Brazos	Yes	-1	1	1	0	0	1	0	0	0	0	0	0	2
38	**Drought Management**	BLANCO	Mandatory water use reduction by 20%	No	$66	66	2020	Guadalupe	No	1	0	1	0	0	0	1	0	1	0	0	0	4
39	**Conservation**	BLANCO	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,558	27	2020	Guadalupe	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
40	**Direct Reuse**	BLANCO	Direct reuse of wastewater effluent.	No	$705	146	2030	Guadalupe	No	0	-1	1	0	1	1	0	0	1	0	0	0	3
41	**Drought Management**	BOLING MWD	Mandatory water use reduction by 20%	No	$66	6	2020	Brazos-Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
42	**Drought Management**	BRIARCLIFF	Mandatory water use reduction by 20%	Yes	$66	106	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
43	**Drought Management**	BROOKESMITH SUD	Mandatory water use reduction by 20%	Yes	$66	2	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
44	**Drought Management**	BUDA	Mandatory water use reduction by 20%	Yes	$66	1,309	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
45	**Conservation**	BUDA	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,987.00	793	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
46	**Direct Reuse**	BUDA	Direct reuse of wastewater effluent.	Yes	$0	1,680	2020	Colorado	No	1	-1	1	0	1	1	0	0	1	0	0	0	4
47	**Groundwater Importation (ARWA Pipeline)**	BUDA	Importation of groundwater from the Carrizo-Wilcox aquifer in Gonzales County (Region L) through a pipeline. Buda portion.	Yes	$1,106	2,113	2030	Colorado	No	-1	1	-1	0	0	1	0	0	0	0	0	0	1
48	**Saline Edwards ASR Project**	BUDA	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Edwards BFZ (Saline Zone). In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$1,951	800	2040	Colorado	No	-1	0	0	1	0	0	0	0	1	0	0	0	0
49	**Edwards / Middle Trinity ASR Project**	BUDA	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Trinity aquifer. In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$1,740	600	2020	Colorado	No	-1	0	1	0	0	1	0	0	1	0	0	0	2
50	**Direct Potable Reuse**	BUDA	Directly treat reclaimed water for potable use within the municipality.	Yes	$1,964	2,240	2030	Colorado	No	-1	0	1	1	0	1	-1	0	1	0	0	0	2
51	**Drought Management**	BURNET	Mandatory water use reduction by 20%	No	$66	427	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
52	**Conservation**	BURNET	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,614	813	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
53	**LCRA Contract Amendment with Infrastructure**	BURNET	See Buena Vista Regional Project.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
54	**Buena Vista Regional Project**	BURNET	Contract with LCRA. Expansion of Buchanan WTP and transmission of treated surface water to Buena Vista residents and others	No	$1,136	2,000	2030	Colorado	No	-1	1	1	1	0	0	-1	0	0	0	-1	0	0
55	**Drought Management**	CANEY CREEK MUD OF MATAGORDA COUNTY	Mandatory water use reduction by 20%	No	$66	26	2020	Brazos-Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
56	**Drought Management**	CANYON LAKE WATER SERVICE	Mandatory water use reduction by 20%	Yes	$66	27	2020	Guadalupe	No	1	0	1	0	0	0	1	0	1	0	0	0	4
57	**Drought Management**	CEDAR PARK	Mandatory water use reduction by 20%	Yes	$66	393	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
58	**Conservation**	CEDAR PARK	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,720	582	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
59	**Drought Management**	CIMARRON PARK WATER	Mandatory water use reduction by 20%	No	$66	11	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
60	**Drought Management**	COLUMBUS	Mandatory water use reduction by 20%	No	$66	206	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
61	**Conservation**	COLUMBUS	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,219	581	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
62	**Drought Management**	CORIX UTILITIES TEXAS INC.	Mandatory water use reduction by 20%	Yes	$66	98	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
63	**Expand Local Use of Groundwater**	CORIX UTILITIES TEXAS INC.	Expand use of Gulf Coast aquifer in Colorado Basin of Colorado County	Yes	$50	4	2050	Colorado	No	1	1	1	0	0	0	0	0	0	0	0	0	3

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)): Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
64	**Drought Management**	COTTONWOOD CREEK MUD 1	Mandatory water use reduction by 5%	No	$66	7	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
65	**Drought Management**	COTTONWOOD SHORES	Mandatory water use reduction by 20%	No	$66	80	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
66	**Conservation**	COTTONWOOD SHORES	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,069	32	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
67	**Drought Management**	COUNTY-OTHER, BASTROP	Mandatory water use reduction by 20%	No	$66	609	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
68	**Conservation**	COUNTY-OTHER, BASTROP	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,973	393	2020	All	No	-1	0	1	0	0	0	1	0	1	0	0	0	2
69	**Drought Management**	COUNTY-OTHER, BLANCO	Mandatory water use reduction by 20%	No	$66	122	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
70	**Brush Management**	COUNTY-OTHER, BLANCO	Removal of brush to increase recharge and runoff. Firm yield determined from Pedernales River Watershed Feasibility Study.	No	$1,190	708	2030	Colorado	No	1	-1	1	0	1	1	-1	0	0	0	0	0	2
71	**Drought Management**	COUNTY-OTHER, BURNET	Mandatory water use reduction by 20%	Yes	$66	927	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
72	**Conservation**	COUNTY-OTHER, BURNET	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,390	205	2020	All	No	-1	0	1	0	1	0	1	0	0	0	0	0	2
73	**Marble Falls Regional Project**	COUNTY-OTHER, BURNET	Contract with LCRA. Construction of new raw water intake and regional WTP at Max Starcke Dam, and construction of transmission lines to support future development.	No	$1,436	1,578	2030	Colorado	No	-1	1	1	0	0	0	-1	0	0	0	-1	0	-1
74	**Buena Vista Regional Project**	COUNTY-OTHER, BURNET	Contract with LCRA. Expansion of Buchanan WTP and transmission of treated surface water to Buena Vista residents and others	Yes	$1,136	1,000	2030	Brazos	No	-1	1	1	1	0	0	-1	0	0	0	-1	0	0
75	**Buena Vista Regional Project**	COUNTY-OTHER, BURNET	Contract with LCRA. Expansion of Buchanan WTP and transmission of treated surface water to Buena Vista residents and others	No	$1,136	1,884	2030	Colorado	No	-1	1	1	1	0	0	-1	0	0	0	-1	0	0
76	**New LCRA Contract (with infrastructure)**	COUNTY-OTHER, BURNET	See Buena Vista Regional Project, East Lake Buchanan Regional Project, and Marble Falls Regional Project.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
77	**East Lake Buchanan Regional Project**	COUNTY-OTHER, BURNET	Contract with LCRA. Regional SWTP and deep water intake at Council Creek Village to provide treated water to communities along East Lake Buchanan	No	$1,957	935	2030	Colorado	No	-1	0	1	1	0	0	-1	0	0	0	-1	0	-1
78	**Drought Management**	COUNTY-OTHER, COLORADO	Mandatory water use reduction by 20%	Yes	$66	170	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
79	**Expand Local Use of Groundwater**	COUNTY-OTHER, COLORADO	Expand use of Gulf Coast aquifer in Colorado Basin of Colorado County	Yes	$1,218	133	2020	Colorado	No	-1	0	1	0	0	0	1	0	0	0	0	0	1
80	**Drought Management**	COUNTY-OTHER, FAYETTE	Mandatory water use reduction by 20%	Yes	$66	190	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
81	**Expand Local Use of Groundwater**	COUNTY-OTHER, FAYETTE	Expand use of Gulf Coast aquifer in Lavaca Basin of Fayette County	Yes	$49	41	2020	Lavaca	No	1	1	1	0	0	0	1	0	0	0	0	0	4
82	**Expand Local Use of Groundwater**	COUNTY-OTHER, FAYETTE	Expand use of Sparta aquifer in Colorado Basin of Fayette County	Yes	$1,127	204	2030	Colorado	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
83	**Development of New Groundwater Supply**	COUNTY-OTHER, FAYETTE	Develop a new supply of groundwater in the Sparta aquifer in the Colorado Basin of Fayette County	Yes	$1,498	400	2020	Lavaca	Yes	-1	0	0	0	0	0	0	0	0	0	0	0	-1
84	**Drought Management**	COUNTY-OTHER, GILLESPIE	Mandatory water use reduction by 20%	No	$66	150	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
85	**Brush Management**	COUNTY-OTHER, GILLESPIE	Removal of brush to increase recharge and runoff. Firm yield determined from Pedernales River Watershed Feasibility Study.	No	$1,190	1,125	2030	Colorado	No	1	-1	1	0	1	1	-1	0	0	0	0	0	2
86	**Drought Management**	COUNTY-OTHER, HAYS	Mandatory water use reduction by 20%	Yes	$66	243	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
87	**Groundwater Importation (Hays County Pipeline)**	COUNTY-OTHER, HAYS	Importation of groundwater from the Carrizo-Wilcox aquifer in Gonzales County (Region L) through a pipeline. Region L pipeline runs from delivery point near Kyle to the Wimberley area in Hays County. Region K pipeline will run from a to-	Yes	$774	1,000	2030	Colorado	No	0	1	-1	0	0	-1	0	0	0	0	0	0	-1
88	**Rainwater Harvesting**	COUNTY-OTHER, HAYS	Development of catchment areas to capture rainwater for potable or non-potable use.	Yes	$0	50	2030	Colorado	No	1	-1	1	0	0		0	0	0	0	0	0	1
89	**Saline Edwards ASR Project**	COUNTY-OTHER, HAYS	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Edwards BFZ (Saline Zone). In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$1,950	500	2040	Colorado	No	-1	0	0	1	0	0	0	0	1	0	0	0	0
90	**Edwards / Middle Trinity ASR Project**	COUNTY-OTHER, HAYS	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Trinity aquifer. In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$2,156	289	2030	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
91	**Brush Management**	COUNTY-OTHER, HAYS	Removal of brush to increase recharge and runoff. Firm yield determined from Pedernales River Watershed Feasibility Study.	Yes	$1,190	83	2030	Colorado	No	1	0	1	0	1	1	-1	0	0	0	0	0	3
92	**Expand Local Use of Groundwater**	COUNTY-OTHER, HAYS	Expand use of Trinity aquifer in Colorado Basin of Hays County	Yes	$1,180	200	2070	Colorado	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
93	**Drought Management**	COUNTY-OTHER, LLANO	Mandatory water use reduction by 5%	No	$66	13	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
94	**Drought Management**	COUNTY-OTHER, MATAGORDA	Mandatory water use reduction by 5%	No	$66	53	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
95	**Drought Management**	COUNTY-OTHER, MILLS	Mandatory water use reduction by 20%	No	$66	50	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1))												Total of Screening Factors
										Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	
96	**Drought Management**	COUNTY-OTHER, SAN SABA	Mandatory water use reduction by 20%	No	$66	44	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
97	**Drought Management**	COUNTY-OTHER, TRAVIS	Mandatory water use reduction by 20%	No	$66	174	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
98	**Brush Management**	COUNTY-OTHER, TRAVIS	Removal of brush to increase recharge and runoff. Firm yield determined from Pedernales River Watershed Feasibility Study.	No	$1,190	83	2030	Colorado	No	1	-1	1	0	1	1	-1	0	0	0	0	0	2
99	**Drought Management**	COUNTY-OTHER, TRAVIS (AQUA TEXAS - RIVERCREST)	Mandatory water use reduction by 20%	No	$66	58	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
100	**Conservation**	COUNTY-OTHER, TRAVIS (AQUA TEXAS - RIVERCREST)	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$897	142	2020	Colorado	No	0	0	1	0	1	0	1	0	0	0	0	0	3
101	**Drought Management**	COUNTY-OTHER, WHARTON	Mandatory water use reduction by 20%	Yes	$66	314	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
102	**Drought Management**	COUNTY-OTHER, WILLIAMSON	Mandatory water use reduction by 20%	No	$66	18	2020	Brazos	No	1	0	1	0	0	0	1	0	1	0	0	0	4
103	**Drought Management**	CREEDMOOR-MAHA WSC	Mandatory water use reduction by 5%	Yes	$66	45	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
104	**Conservation**	CREEDMOOR-MAHA WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$3,452	106	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
105	**Water Purchase Amendment**	CREEDMOOR-MAHA WSC	Water purchase amendment with Aqua WSC	Yes	$1,222	335	2040	Colorado	No	-1	1	1	0	0	0	0	0	1	0	0	0	2
106	**Edwards / Middle Trinity ASR Project**	CREEDMOOR-MAHA WSC	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Trinity aquifer. In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$2,156	289	2030	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
107	**Drought Management**	CYPRESS RANCH WCID 1	Mandatory water use reduction by 5%	No	$66	7	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
108	**Conservation**	CYPRESS RANCH WCID 1	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$3,804	21	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
109	**Drought Management**	DEER CREEK RANCH WATER	Mandatory water use reduction by 5%	No	$66	5	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
110	**Drought Management**	DRIPPING SPRINGS WSC	Mandatory water use reduction by 20%	Yes	$66	1,380	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
111	**Conservation**	DRIPPING SPRINGS WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,056	576	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
112	**Rainwater Harvesting**	DRIPPING SPRINGS WSC	Development of catchment areas to capture rainwater for potable or non-potable use.	Yes	$0	81	2030	Colorado	No	1	-1	1	0	0		0	0	0	0	0	0	1
113	**LCRA Contract Amendment**	DRIPPING SPRINGS WSC	Amend existing contract with LCRA for additional supply	Yes	$145	2,000	2050	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
114	**Direct Reuse**	DRIPPING SPRINGS WSC	Direct reuse of wastewater effluent.	Yes	$251	390	2030	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
115	**Direct Potable Reuse**	DRIPPING SPRINGS WSC	Directly treat reclaimed water for potable use within the municipality.	Yes	$2,582	560	2030	Colorado	No	-1	0	1	1	0	1	-1	0	1	0	0	0	2
116	**Expand Local Use of Groundwater**	DRIPPING SPRINGS WSC	Expand use of Trinity aquifer in Colorado Basin of Hays County	Yes	$1,023	300	2040	Colorado	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
117	**Drought Management**	EAGLE LAKE	Mandatory water use reduction by 20%	No	$66	97	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
118	**Drought Management**	EL CAMPO	Mandatory water use reduction by 15%	No	$66	1	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
119	**Drought Management**	ELGIN	Mandatory water use reduction by 20%	Yes	$66	321	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
120	**Conservation**	ELGIN	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,619	807	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
121	**Expand Local Use of Groundwater**	ELGIN	Expand use of Carrizo-Wilcox aquifer in Colorado Basin of Bastrop County	Yes	$80	50	2060	Colorado	No	1	-1	1	0	0	1	0	0	0	0	0	0	2
122	**Development of New Groundwater Supply**	ELGIN	Develop a new supply of groundwater in the Trinity aquifer in the Colorado Basin of Travis County	Yes	$953	1,825	2060	Bastrop	Yes	0	0	0	0	0	0	0	0	0	0	0	0	0
123	**Drought Management**	FAYETTE COUNTY WCID MONUMENT HILL	Mandatory water use reduction by 20%	No	$66	33	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
124	**Conservation**	FAYETTE COUNTY WCID MONUMENT HILL	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,447	78	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
125	**Drought Management**	FAYETTE WSC	Mandatory water use reduction by 20%	No	$66	166	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
126	**Drought Management**	FLATONIA	Mandatory water use reduction by 20%	No	$66	74	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
127	**Conservation**	FLATONIA	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,745	99	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
128	**Drought Management**	FREDERICKSBURG	Mandatory water use reduction by 20%	No	$66	610	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
129	**Conservation**	FREDERICKSBURG	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,300	1,802	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
130	**Direct Reuse**	FREDERICKSBURG	Direct reuse of wastewater effluent.	No	$5,977	132	2030	Colorado	No	-1	-1	1	0	1	1	0	0	1	0	0	0	2
131	**Drought Management**	GARFIELD WSC	Mandatory water use reduction by 5%	Yes	$66	16	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
132	**Expand Local Use of Groundwater**	GARFIELD WSC	Expand use of Trinity aquifer in Colorado Basin of Travis County	Yes	$85	47	2050	Colorado	No	1	1	1	0	0	0	0	0	0	0	0	0	3
133	**Drought Management**	GEORGETOWN	Mandatory water use reduction by 20%	No	$66	22	2020	Brazos	No	1	0	1	0	0	0	1	0	1	0	0	0	4
134	**Conservation**	GEORGETOWN	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,600	41	2020	Brazos	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
135	**Drought Management**	GOFORTH SUD	Mandatory water use reduction by 5%	Yes	$66	26	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
136	**Drought Management**	GOLDTHWAITE	Mandatory water use reduction by 20%	Yes	$66	78	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
137	**Conservation**	GOLDTHWAITE	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,907	65	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
138	**Goldthwaite Water Supply**	GOLDTHWAITE	Multi-step water supply strategy involving water permit acquisition and amendments, reservoir development, and reuse. Limited information available.	No	N/A	0	2020	Colorado	No	-1	-1	1	0	0	1	0	0	0	0	0	0	0
139	**Drought Management**	GRANITE SHOALS	Mandatory water use reduction by 5%	Yes	$66	53	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
140	**LCRA Contract Amendment**	GRANITE SHOALS	Amend existing contract with LCRA for additional supply	Yes	$145	170	2060	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
141	**Rainwater Harvesting**	HAYS	Development of catchment areas to capture rainwater for potable or non-potable use.	Yes	$0	7	2030	Colorado	No	1	-1	1	0	0	0	0	0	0	0	0	0	1
142	**Development of New Groundwater Supply**	HAYS	Develop a new supply of groundwater in the Trinity aquifer in the Colorado Basin of Hays County	Yes	$3,830	100	2030	Colorado	No	-1	0	1	0	0	0	0	0	0	0	0	0	0
143	**Edwards / Middle Trinity ASR Project**	HAYS	Non-drought year available freshwater Edwards BFZ aquifer volume will be stored in the Trinity aquifer. In times of drought, water will be pumped, treated, and piped to users within the BSEACD district.	Yes	$3,747	146	2030	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
144	**New Water Purchase**	HAYS	Water purchase from Buda	Yes	$1,536	140	2060	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
145	**Drought Management**	HAYS	Mandatory water use reduction by 20%	Yes	$66	107	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
146	**Drought Management**	HAYS COUNTY WCID 1	Mandatory water use reduction by 20%	Yes	$66	149	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
147	**Conservation**	HAYS COUNTY WCID 1	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,606	226	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
148	**Drought Management**	HAYS COUNTY WCID 2	Mandatory water use reduction by 20%	Yes	$66	117	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
149	**Conservation**	HAYS COUNTY WCID 2	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,564	259	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
150	**Drought Management**	HORNSBY BEND UTILITY	Mandatory water use reduction by 5%	No	$66	47	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
151	**Drought Management**	HORSESHOE BAY	Mandatory water use reduction by 25%	Yes	$66	641	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
152	**Conservation**	HORSESHOE BAY	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$733	1,645	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
153	**Direct Reuse**	HORSESHOE BAY	Direct reuse of wastewater effluent.	No	$669	154	2030	Colorado	No	0	-1	1	0	1	1	1	0	1	0	0	0	4
154	**LCRA Contract Amendment**	HORSESHOE BAY	Amend existing contract with LCRA for additional supply	Yes	$145	800	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
155	**Drought Management**	HURST CREEK MUD	Mandatory water use reduction by 20%	Yes	$66	313	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
156	**Conservation**	HURST CREEK MUD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$636.00	776	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
157	**Drought Management**	IRRIGATION, COLORADO	Reduce water demands based on lack of available water.	Yes	$132	8,385	2020	All	No	1	0	1	0	-1	-1	0	-1	-1	-1	0	0	-3
158	**Expand Local Use of Groundwater**	IRRIGATION, COLORADO	Expand use of Gulf Coast aquifer in Brazos-Colorado Basin of Colorado County	Yes	$177	2,500	2020	Brazos-Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
159	**Expand Local Use of Groundwater**	IRRIGATION, COLORADO	Expand use of Gulf Coast aquifer in Colorado Basin of Colorado County	Yes	$249	550	2020	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2

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	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)): Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
160	**Expand Local Use of Groundwater**	IRRIGATION, COLORADO	Expand use of Gulf Coast aquifer in Lavaca Basin of Colorado County	Yes	$171	5,000	2020	Lavaca	No	1	0	1	0	0	0	0	0	0	0	0	0	2
161	**LCRA WMP - Interruptible Water**	IRRIGATION, COLORADO - MATAGORDA - WHARTON	Interruptible water available using projected municipal and industrial demands versus fully authorized demands	Yes	$60	63,405	2020	All	No	1	1	1	0	1	1	0	0	0	1	-1	0	5
162	**Austin Return Flows**	IRRIGATION, COLORADO - MATAGORDA - WHARTON	Return flows from City of Austin and others	Yes	$11	25,746	2020	All	No	1	0	1	0	1	1	0	0	1	1	0	0	6
163	**Conservation - On farm Conservation**	IRRIGATION, COLORADO	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	4,412	2020	Brazos-Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
164	**Conservation - On farm Conservation**	IRRIGATION, COLORADO	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	1,371	2020	Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
165	**Conservation - On farm Conservation**	IRRIGATION, COLORADO	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	5,537	2020	Lavaca	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
166	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, COLORADO	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	3,716	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
167	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, COLORADO	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	1,155	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
168	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, COLORADO	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	4,665	2020	Lavaca	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
169	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, COLORADO	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	3,156	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
170	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, COLORADO	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	981	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
171	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, COLORADO	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	3,961	2020	Lavaca	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
172	**Conservation - Sprinkler Irrigation**	IRRIGATION, COLORADO	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	1,753	2020	Brazos-Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
173	**Conservation - Sprinkler Irrigation**	IRRIGATION, COLORADO	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	545	2020	Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
174	**Conservation - Sprinkler Irrigation**	IRRIGATION, COLORADO	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	2,201	2020	Lavaca	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
175	**Conservation - Drip Irrigation**	IRRIGATION, GILLESPIE	Micro irrigation method to apply water to the root zone of crops through low pressure, low volume devices	No	$643	28	2020	Colorado	No	0	-1	1	0	1	0	0	0	1	1	0	0	3
176	**Drought Management**	IRRIGATION, MATAGORDA	Reduce water demands based on lack of available water.	Yes	$193	17,139	2020	All	No	1	0	1	0	-1	-1	0	-1	-1	-1	0	0	-3
177	**Expand Local Use of Groundwater**	IRRIGATION, MATAGORDA	Expanded use of Gulf Coast aquifer in Colorado-Lavaca Basin of Matagorda County	Yes	$430	300	2020	Lavaca	No	1	0	1	0	0	0	0	0	0	0	0	0	2
178	**Development of New Groundwater Supply**	IRRIGATION, MATAGORDA	Develop a new supply of groundwater in the Gulf Coast aquifer in the Colorado Basin of Matagorda County	Yes	$180	510	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	0	0	3
179	**Conservation - On farm Conservation**	IRRIGATION, MATAGORDA	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	5,072	2020	Brazos-Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
180	**Conservation - On farm Conservation**	IRRIGATION, MATAGORDA	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	42	2020	Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
181	**Conservation - On farm Conservation**	IRRIGATION, MATAGORDA	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	4,978	2020	Colorado-Lavaca	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
182	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, MATAGORDA	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	10,872	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
183	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, MATAGORDA	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	90	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
184	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, MATAGORDA	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	10,670	2020	Colorado-Lavaca	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
185	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, MATAGORDA	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	2,541	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
186	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, MATAGORDA	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	21	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
187	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, MATAGORDA	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	2,494	2020	Colorado-Lavaca	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
188	**Conservation - Sprinkler Irrigation**	IRRIGATION, MATAGORDA	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	1,412	2020	Brazos-Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
189	**Conservation - Sprinkler Irrigation**	IRRIGATION, MATAGORDA	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	12	2020	Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
190	**Conservation - Sprinkler Irrigation**	IRRIGATION, MATAGORDA	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	1,385	2020	Colorado-Lavaca	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
191	**Drought Management**	IRRIGATION, MILLS	Reduce water demands based on lack of available water.	Yes	$183	149	2020	Brazos	No	1	0	1	0	0	-1	0	-1	0	-1	0	0	-1

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
192	**Expansion of Groundwater Supply**	IRRIGATION, MILLS	Expand use of Trinity aquifer in Brazos Basin of Mills County	Yes	$403	300	2020	Brazos	No	1	1	1	0	0	0	1	0	0	0	0	0	4
193	**Conservation - Drip Irrigation**	IRRIGATION, MILLS	Micro irrigation method to apply water to the root zone of crops through low pressure, low volume devices	Yes	$534	459	2020	Brazos	No	0	-1	1	0	1	0	0	0	1	1	0	0	3
194	**Conservation - Drip Irrigation**	IRRIGATION, SAN SABA	Micro irrigation method to apply water to the root zone of crops through low pressure, low volume devices	No	$382	626	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
195	**Drought Management**	IRRIGATION, WHARTON	Reduce water demands based on lack of available water.	Yes	$203	8,480	2020	All	No	1	0	1	0	-1	-1	0	-1	-1	-1	0	0	-3
196	**Expand Local Use of Groundwater**	IRRIGATION, WHARTON	Expand use of Gulf Coast aquifer in Brazos-Colorado Basin of Wharton County	Yes	$170	5,000	2020	Brazos-Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
197	**Expand Local Use of Groundwater**	IRRIGATION, WHARTON	Expand use of Gulf Coast aquifer in Colorado Basin of Wharton County	Yes	$208	600	2020	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
198	**Conservation - On farm Conservation**	IRRIGATION, WHARTON	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	15,590	2020	Brazos-Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
199	**Conservation - On farm Conservation**	IRRIGATION, WHARTON	On-Farm conservation measures to reduce the amount of water required for rice growing	Yes	$113	7,106	2020	Colorado	No	1	-1	1	0	-1	0	0	0	-1	1	0	0	0
200	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, WHARTON	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	9,055	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
201	**Conservation - Irrigation Conveyance Improvements**	IRRIGATION, WHARTON	Improvements to the methods of water delivery to the fields in order to reduce the amount of water needed/lost	Yes	$193	4,127	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	4
202	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, WHARTON	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	5,052	2020	Brazos-Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
203	**Conservation - Real-Time Use Metering and Monitoring**	IRRIGATION, WHARTON	Installation of meters that assess water use by automatically recording and transferring flow data at 15-minute intervals	Yes	$120	2,303	2020	Colorado	No	1	-1	1	0	1	0	0	0	1	1	0	0	3
204	**Conservation - Sprinkler Irrigation**	IRRIGATION, WHARTON	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	2,807	2020	Brazos-Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
205	**Conservation - Sprinkler Irrigation**	IRRIGATION, WHARTON	Rice farming conversion to sprinkler irrigation (LEPA) versus field flooding	Yes	$185	1,279	2020	Colorado	No	1	-1	1	0	-1	-1	0	0	1	0	0	0	0
206	**Drought Management**	JOHNSON CITY	Mandatory water use reduction by 20%	Yes	$66	91	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
207	**Conservation**	JOHNSON CITY	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,116	31	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
208	**Expand Local Use of Groundwater**	JOHNSON CITY	Expand use of Ellenburger-San Saba aquifer in Colorado Basin of Blanco County	Yes	$2,030	100	2030	Colorado	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
209	**Drought Management**	JONESTOWN WSC	Mandatory water use reduction by 20%	Yes	$66	165	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
210	**Conservation**	JONESTOWN WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,089.00	56	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
211	**Drought Management**	KELLY LANE WCID 1	Mandatory water use reduction by 25%	No	$66	73	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
212	**Conservation**	KELLY LANE WCID 1	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,865	52	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
213	**Drought Management**	KEMPNER WSC	Mandatory water use reduction by 30%	No	$66	49	2020	Brazos	No	1	0	1	0	0	0	1	0	1	0	0	0	4
214	**Conservation**	KEMPNER WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,194	12	2020	Brazos	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
215	**Drought Management**	KINGSLAND WSC	Mandatory water use reduction by 5%	No	$66	61	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
216	**Drought Management**	LA GRANGE	Mandatory water use reduction by 20%	No	$66	245	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
217	**Conservation**	LA GRANGE	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,100	86	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
218	**Drought Management**	LAGO VISTA	Mandatory water use reduction by 20%	No	$66	446	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
219	**Conservation**	LAGO VISTA	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,447	1,198	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
220	**Direct Reuse**	LAGO VISTA	Direct reuse of wastewater effluent.	No	$140	673	2030	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
221	**Drought Management**	LAKEWAY MUD	Mandatory water use reduction by 20%	Yes	$66	502	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
222	**Conservation**	LAKEWAY MUD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,414	1,168	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
223	**Direct Reuse**	LAKEWAY MUD	Direct reuse of wastewater effluent.	Yes	$306	900	2030	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
224	**Austin Return Flows/Indirect Reuse**	LCRA/Austin	Return flows from City of Austin to Colorado River	Yes	$11	71,628	2020	Colorado	No	1	0	1	0	1	0	0	0	1	0	0	0	4
225	**Downstream Return Flows**	LCRA	Return flows from Pflugerville to Colorado River	Yes	$11	8,267	2020	Colorado	No	1	0	1	0	1	0	0	0	1	0	0	0	4
226	**Enhanced Municipal and Industrial Conservation**	LCRA	Condensate Capture strategy by Reducing GPCD and Industrial water use through development of LCRA customer savings by incorporating	Yes	$262	20,000	2020	Colorado	No	1	0	1	0	0	1	0	0	1	0	0	0	4
227	**LCRA Water Management Plan Amendments**	LCRA	See LCRA WMP - Interruptible Water	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A
228	**Amendments to Water Rights**	LCRA	Amend run-of-river water rights for additional diversion locations and storage rights	Yes	$0	N/A	2020	Colorado	No	1	0	1	0	0	0	0	0	1	0	0	0	3
229	**Acquire Additional Water Rights**	LCRA	Purchase of water rights owned by others in the basin.	Yes	$500	250	2020	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
230	**Alternative - Supplement Bay and Estuary Inflows with Brackish Groundwater**	LCRA	Brackish groundwater delivery to the Bay to achieve the same effect as volume of released stored water from Highland Lakes	Yes	$532	12,000	2030	Matagorda	No	0	0	0	-1	-1	0	-1	0	0	0	1	0	-2
231	**Groundwater Importation**	LCRA	Import groundwater from outside of region (assume Carrizo-Wilcox aquifer water from Burleson County).	Yes	$829	35,000	2040	N/A	No	0	0	-1	0	0	0	0	0	0	0	0	0	-1
232	**Development of New Groundwater Supply - FPP Onsite**	LCRA	Develop a new supply of groundwater in the Gulf Coast aquifer in the Colorado Basin of Fayette County	Yes	$675	40	2030	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
233	**Alternative - Development of New Groundwater Supply - FPP Onsite**	LCRA	Develop a new supply of groundwater in the Gulf Coast aquifer in the Colorado Basin of Fayette County	Yes	$117	700	2040	Colorado	No	1	1	1	0	0	0	0	0	1	0	0	0	4
234	**Development of New Groundwater Supply - FPP Offsite**	LCRA	Develop a new supply of groundwater in the Carrizo-Wilcox aquifer in the Colorado Basin of Fayette County	Yes	$1,257	2,500	2030	Colorado	No	-1	1	0	0	0	0	0	0	1	0	0	0	1
235	**Alternative - Brackish Groundwater Desalination**	LCRA	Extracting and treating brackish groundwater from the Gulf Coast aquifer in Matagorda County for use in the Bay City area	Yes	$1,393	22,400	2040	Colorado	No	-1	1	0	0	0	0	-1	0	0	0	0	0	-1
236	**Expand Local Use of Groundwater**	LCRA	Expand use of Carrizo-Wilcox aquifer in Colorado Basin of Bastrop County	Yes	$833	30	2030	Colorado	No	0	0	1	0	0	0	0	0	0	0	0	0	1
237	**Import Return Flows from Williamson County**	LCRA	Return flows from Brazos River basin to Colorado basin through transmission of WWTP effluent	Yes	$243	25,000	2030	Colorado	Yes	1	0	1	0	0	0	-1	0	1	1	1	-1	3
238	**Baylor Creek Reservoir**	LCRA	Reservoir (Baylor Creek) using diversions from existing LCRA water rights	Yes	$907	18,000	2040	Colorado	No	0	0	1	0	-1	0	0	0	1	1	1	0	3
239	**Aquifer Storage and Recovery**	LCRA	Surface water from the Colorado River is diverted to aquifer storage for later recovery	Yes	$1,300	12,973	2040	Colorado	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
240	**Enhanced Recharge and Conjunctive Use**	LCRA	Surface water from the Colorado River is diverted to recharge basins	Yes	$375	14,486	2030	Colorado	No	0	1	1	0	0	0	0	0	0	1	0	0	3
241	**LCRA - Off-Channel Reservoir(s)**	LCRA	Off-Channel reservoir (Mid Basin Site) using diversions from existing LCRA water rights	Yes	$2,350	20,000	2030	Colorado	No	-1	0	1	0	-1	0	0	0	1	1	1	0	2

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	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)): Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
242	**LCRA - Off-Channel Reservoir(s)**	LCRA	Off-Channel reservoir (Prairie Site) using diversions from existing LCRA water rights	Yes	$45	19,500	2030	Colorado	No	-1	0	1	0	-1	0	0	0	1	1	1	0	2
243	**LCRA - Off-Channel Reservoir(s)**	LCRA	Off-Channel reservoir receiving diversions from LCRA's Excess Flows permit	Yes	$1,241	39,247	2030	Colorado	No	-1	0	1	0	-1	0	0	0	1	1	1	0	2
244	**Drought Management**	LEANDER	Mandatory water use reduction by 20%	Yes	$66	686	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
245	**LCRA Contract Amendment**	LEANDER	Amend existing contract with LCRA for additional supply	Yes	$145	2,600	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
246	**Drought Management**	LEE COUNTY WSC	Mandatory water use reduction by 20%	No	$66	69	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
247	**Drought Management**	LLANO	Mandatory water use reduction by 20%	Yes	$66	157	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
248	**Conservation**	LLANO	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,490	295	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
249	**New Water Purchase**	LLANO	Water purchase from Burnet	Yes	$45,619	177	2020	Colorado	No	-1	1	1	0	0	0	0	0	1	0	0	0	2
250	**Direct Potable Reuse**	LLANO	Directly treat reclaimed water for potable use within the municipality.	Yes	$3,764	280	2030	Colorado	No	-1	0	1	1	0	0	-1	0	1	0	0	0	1
251	**Reservoir Capacity Expansion**	LLANO	Installation of flashboard system during drought conditions along the downstream of the Llano River Lake.	Yes	N/A	0	N/A	Colorado	No	-1	-1	1	0	0	0	0	0	0	0	-1	0	-2
252	**Drought Management**	LOOP 360 WSC	Mandatory water use reduction by 20%	Yes	$66	223	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
253	**Conservation**	LOOP 360 WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$606.00	679	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
254	**Drought Management**	MANOR	Mandatory water use reduction by 20%	No	$66	395	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
255	**Development of New Groundwater Supply**	MANUFACTURING, FAYETTE	Develop a new supply of groundwater in the Yegua-Jackson aquifer in the Lavaca Basin of Fayette County	Yes	$3,960	100	2030	Lavaca	No	-1	1	1	0	0	0	0	0	0	0	0	0	1
256	**Drought Management**	MANVILLE WSC	Mandatory water use reduction by 20%	Yes	$66	993	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
257	**Expand Local Use of Groundwater**	MANVILLE WSC	Expand use of Trinity aquifer in Colorado Basin of Travis County	Yes	$643	703	2070	Colorado	No	0	1	1	0	0	0	1	0	0	0	0	0	3
258	**Drought Management**	MARBLE FALLS	Mandatory water use reduction by 20%	Yes	$66	776	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
259	**Conservation**	MARBLE FALLS	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,340.00	2,566	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
260	**Marble Falls Regional Project**	MARBLE FALLS	Contract with LCRA. Construction of new raw water intake and regional WTP at Max Starcke Dam, and construction of transmission lines to support future development.	Yes	$1,436	4,000	2030	Colorado	No	-1	1	1	0	0	0	-1	0	0	0	-1	0	-1
261	**LCRA Contract Amendment with Infrastructure**	MARBLE FALLS	See Marble Falls Regional Project	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A

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	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
262	**Direct Reuse**	MARBLE FALLS	Direct reuse of wastewater effluent.	Yes	$296	500	2030	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
263	**Drought Management**	MARKHAM MUD	Mandatory water use reduction by 5%	No	$66	5	2020	Colorado-Lavaca	No	1	0	1	0	0	0	1	0	1	0	0	0	4
264	**Drought Management**	MATAGORDA COUNTY WASTE DISPOSAL & WSC	Mandatory water use reduction by 20%	No	$66	6	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
265	**Conservation**	MATAGORDA COUNTY WASTE DISPOSAL & WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,044.00	16	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
266	**Drought Management**	MATAGORDA COUNTY WCID 6	Mandatory water use reduction by 5%	No	$66	25	2020	Brazos-Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
267	**Drought Management**	MEADOWLAKES	Mandatory water use reduction by 20%	Yes	$66	155	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
268	**Conservation**	MEADOWLAKES	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,054.00	377	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
269	**Direct Reuse**	MEADOWLAKES	Direct reuse of wastewater effluent.	Yes	$0	75	2020	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
270	**Mining Conservation**	MINING, BASTROP	Recycling existing pumped groundwater for use in mining operations up to five times.	Yes	$16	308	2020	Guadalupe	No	1	1	1	-1	0	1	0	0	0	0	0	0	3
271	**Development of New Groundwater Supply**	MINING, BURNET	Develop a new supply of groundwater in the Ellenburger-San Saba aquifer in the Brazos Basin of Burnet County	Yes	$534	700	2050	Brazos	No	0	1	1	0	0	0	0	0	0	0	0	0	2
272	**Development of New Groundwater Supply**	MINING, BURNET	Develop a new supply of groundwater in the Hickory aquifer in the Colorado Basin of Burnet County	Yes	$432	1,000	2030	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
273	**Development of New Groundwater Supply**	MINING, BURNET	Develop a new supply of groundwater in the Marble Falls aquifer in the Colorado Basin of Burnet County	Yes	$307	1,000	2040	Colorado	No	1	0	1	0	0	0	0	0	0	0	0	0	2
274	**Expand Local Use of Groundwater**	MINING, BURNET	Expand use of Ellenburger-San Saba aquifer in Colorado Basin of Burnet County	Yes	$581	1,000	2030	Colorado	No	0	1	1	0	0	0	0	0	0	0	0	0	2
275	**Mining Conservation**	MINING, BURNET	Recycling existing pumped groundwater for use in mining operations up to five times.	Yes	$33	1,800	2020	Colorado	No	1	1	1	-1	0	1	0	0	0	0	0	0	3
276	**Expand Local Use of Groundwater**	MINING, FAYETTE	Expand use of Yegua-Jackson aquifer in Colorado Basin of Fayette County	Yes	$355	760	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	0	0	3
277	**Expand Local Use of Groundwater**	MINING, HAYS	Expand use of Trinity aquifer in Colorado Basin of Hays County	Yes	$373	600	2020	Colorado	No	1	-1	1	0	0	0	0	0	0	0	0	0	1
278	**New Water Purchase**	MINING, HAYS	Water purchase (reuse water) from Buda	Yes	$1,597	500	2040	Colorado	No	-1	1	1	0	0	0	0	0	1	0	0	0	2
279	**Drought Management**	NORTH AUSTIN MUD 1	Mandatory water use reduction by 5%	Yes	$66	43	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
280	**New LCRA Contract**	NORTH AUSTIN MUD 1	Contract with LCRA for water	Yes	$145	80	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2

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	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
281	**New LCRA Contract**	NORTH AUSTIN MUD 1	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	690	2040	Brazos	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
282	**Drought Management**	NORTH SAN SABA WSC	Mandatory water use reduction by 20%	No	$66	34	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
283	**Conservation**	NORTH SAN SABA WSC	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,231.00	85	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
284	**Drought Management**	NORTHTOWN MUD	Mandatory water use reduction by 5%	Yes	$66	63	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
285	**New LCRA Contract**	NORTHTOWN MUD	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	1,300	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
286	**Drought Management**	OAK SHORES WATER SYSTEM	Mandatory water use reduction by 20%	No	$66	27	2020		No	1	0	1	0	0	0	1	0	1	0	0	0	4
287	**Conservation**	OAK SHORES WATER SYSTEM	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,302.00	70	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
288	**Drought Management**	PALACIOS	Mandatory water use reduction by 20%	No	$66	70	2020	Colorado-Lavaca	No	1	0	1	0	0	0	1	0	1	0	0	0	4
289	**Drought Management**	PFLUGERVILLE	Mandatory water use reduction by 25%	Yes	$66	5,103	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
290	**Conservation**	PFLUGERVILLE	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,149	754	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
291	**LCRA Contract Amendment**	PFLUGERVILLE	Amend existing contract with LCRA for additional supply	Yes	$145	3,400	2050	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
292	**Expand Local Use of Groundwater**	PFLUGERVILLE	Expand use of Edwards BFZ aquifer in Colorado Basin of Travis County	Yes	$50	20	2040	Colorado	No	1	-1	1	0	0	0	1	0	0	0	0	0	2
293	**Drought Management**	POLONIA WSC	Mandatory water use reduction by 20%	No	$66	8	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
294	**Drought Management**	RICHLAND SUD	Mandatory water use reduction by 20%	No	$66	41	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
295	**Conservation**	RICHLAND SUD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,532	72	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
296	**Drought Management**	ROLLINGWOOD	Mandatory water use reduction by 20%	Yes	$66	70	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
297	**Conservation**	ROLLINGWOOD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,326	148	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
298	**New LCRA Contract**	ROLLINGWOOD	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	250	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
299	**Drought Management**	ROUGH HOLLOW IN TRAVIS COUNTY	Mandatory water use reduction by 20%	No	$66	179	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
300	**Conservation**	ROUGH HOLLOW IN TRAVIS COUNTY	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,632.00	319	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
301	**Drought Management**	ROUND ROCK	Mandatory water use reduction by 25%	No	$66	118	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
302	**Conservation**	ROUND ROCK	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,250.00	6	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
303	**Drought Management**	SAN SABA	Mandatory water use reduction by 20%	No	$66	214	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
304	**Conservation**	SAN SABA	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,031.00	556	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
305	**Drought Management**	SCHULENBERG	Mandatory water use reduction by 20%	Yes	$66	141	2020	Lavaca	No	1	0	1	0	0	0	1	0	1	0	0	0	4
306	**Conservation**	SCHULENBERG	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,628.00	254	2020	Lavaca	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
307	**Drought Management**	SENNA HILLS MUD	Mandatory water use reduction by 20%	Yes	$66	84	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
308	**Conservation**	SENNA HILLS MUD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,045.00	321	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
309	**Drought Management**	SHADY HOLLOW MUD	Mandatory water use reduction by 20%	No	$66	144	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
310	**Conservation**	SHADY HOLLOW MUD	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$2,029.00	90	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
311	**Drought Management**	SMITHVILLE	Mandatory water use reduction by 20%	Yes	$66	606	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
312	**Conservation**	SMITHVILLE	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,152.00	97	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
313	**Development of New Groundwater Supply**	SMITHVILLE	Develop a new supply of groundwater in the Yegua-Jackson aquifer in the Colorado Basin of Fayette County. To be transferred to Bastrop County.	Yes	$1,887	700	2030	Colorado	Yes	-1	1	-1	0	0	0	0	0	0	0	0	0	-1
314	**New LCRA Contract (with infrastructure)**	SMITHVILLE	Purchase SW through contract and construct new SWTP and transmission line from Colorado River	Yes	$1,961	700	2070	Colorado	No	-1	0	1	0	0	0	-1	0	0	0	-1	0	-2
315	**LCRA Contract Amendment**	STEAM-ELECTRIC, FAYETTE	Amend existing contract with LCRA for additional supply	Yes	$145	4,300	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
316	**STPNOC Alternate Canal Delivery**	STEAM-ELECTRIC, MATAGORDA	Divert available Garwood water during winter months through irrigation canal system upstream of Bay City Dam. Pipeline from canal to reservoir.	Yes	$266	12,727	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
317	**LCRA Contract Amendment**	STEAM-ELECTRIC, MATAGORDA	Amend existing contract with LCRA for additional supply	Yes	$145	8,300	2020	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
318	**STPNOC Brackish Surface Water Blending**	STEAM-ELECTRIC, MATAGORDA	Under emergency conditions, the TCEQ can approve STPNOC to pump brackish surface water to blend with the freshwater in their reservoir	Yes	$0	3,000	2020	Colorado	No	1	1	1	0	0	1	0	0	0	0	0	0	4
319	**Drought Management**	SUNSET VALLEY	Mandatory water use reduction by 20%	Yes	$66	82	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
320	**Conservation**	SUNSET VALLEY	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$876.00	343	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
321	**Rainwater Harvesting**	SUNSET VALLEY	Development of catchment areas to capture rainwater for potable or non-potable use.	Yes	$0	4	2030	Colorado	No	1	-1	1	0	0	1	0	0	0	0	0	0	2
322	**Expand Local Use of Groundwater**	SUNSET VALLEY	Expand use of Edwards BFZ aquifer in Colorado Basin of Travis County	Yes	$120	50	2040	Colorado	No	1	-1	1	0	0	1	0	0	0	0	0	0	2
323	**New LCRA Contract**	SUNSET VALLEY	Contract with LCRA for water.	Yes	$145	300	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
324	**Development of New Groundwater Supply**	SUNSET VALLEY	Develop a new supply of groundwater in the Trinity aquifer in the Colorado Basin of Travis County	Yes	$2,063	300	2040	Colorado	No	-1	1	1	0	0	0	1	0	0	0	0	0	2
325	**Drought Management**	SWEETWATER COMMUNITY	Mandatory water use reduction by 20%	No	$66	172	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
326	**Drought Management**	TRAVIS COUNTY MUD 10	Mandatory water use reduction by 25%	Yes	$66	23	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
327	**Conservation**	TRAVIS COUNTY MUD 10	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,613	30	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
328	**Development of New Groundwater Supply**	TRAVIS COUNTY MUD 10	Develop a new supply of groundwater in the Trinity aquifer in the Colorado Basin of Travis County	Yes	$3,830	100	2030	Colorado	No	-1	1	1	0	0	0	1	0	0	0	0	0	2
329	**Drought Management**	TRAVIS COUNTY MUD 14	Mandatory water use reduction by 5%	Yes	$66	14	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
330	**Water Purchase Amendment**	TRAVIS COUNTY MUD 14	Water purchase amendment with Aqua WSC	Yes	$1,222	35	2050	Colorado	No	-1	1	1	0	0	0	0	0	1	0	0	0	2
331	**Drought Management**	TRAVIS COUNTY MUD 2	Mandatory water use reduction by 20%	No	$66	56	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
332	**Drought Management**	TRAVIS COUNTY MUD 4	Mandatory water use reduction by 25%	No	$66	360	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
333	**Conservation**	TRAVIS COUNTY MUD 4	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$569	1,198	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
334	**Drought Management**	TRAVIS COUNTY WCID 10	Mandatory water use reduction by 25%	Yes	$66	796	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
335	**Conservation**	TRAVIS COUNTY WCID 10	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$772.00	2,275	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
336	**New LCRA Contract**	TRAVIS COUNTY WCID 10	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	2,300	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
337	**Drought Management**	TRAVIS COUNTY WCID 17	Mandatory water use reduction by 25%	Yes	$66	2,132	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1)) Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	Total of Screening Factors
338	**Conservation**	TRAVIS COUNTY WCID 17	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,390.00	4,451	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
339	**Direct Reuse**	TRAVIS COUNTY WCID 17	Direct reuse of wastewater effluent.	Yes	$1,410	510	2030	Colorado	No	-1	0	1	0	1	0	0	0	1	0	0	0	2
340	**Drought Management**	TRAVIS COUNTY WCID 18	Mandatory water use reduction by 30%	Yes	$66	458	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
341	**Conservation**	TRAVIS COUNTY WCID 18	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,173.00	75	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
342	**Drought Management**	TRAVIS COUNTY WCID 19	Mandatory water use reduction by 20%	No	$66	82	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
343	**Conservation**	TRAVIS COUNTY WCID 19	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$541.00	203	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
344	**Drought Management**	TRAVIS COUNTY WCID 20	Mandatory water use reduction by 20%	No	$66	106	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
345	**Conservation**	TRAVIS COUNTY WCID 20	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$693.00	263	2020	Colorado	No	0	0	1	0	0	0	0	0	1	0	0	0	2
346	**Drought Management**	TRAVIS COUNTY WCID POINT VENTURE	Mandatory water use reduction by 20%	Yes	$66	82	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
347	**Conservation**	TRAVIS COUNTY WCID POINT VENTURE	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,442.00	216	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
348	**LCRA Contract Amendment**	TRAVIS COUNTY WCID POINT VENTURE	Amend existing contract with LCRA for additional supply	Yes	$145	50	2070	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
349	**Drought Management**	WEIMAR	Mandatory water use reduction by 20%	No	$66	90	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
350	**Conservation**	WEIMAR	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,582.00	161	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
351	**Drought Management**	WELLS BRANCH MUD	Mandatory water use reduction by 5%	Yes	$66	74	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
352	**New LCRA Contract**	WELLS BRANCH MUD	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	1,300	2040	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
353	**New LCRA Contract**	WELLS BRANCH MUD	Once contract with City of Austin ends, contract with LCRA for water.	Yes	$145	100	2040	Brazos	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
354	**Drought Management**	WEST END WSC	Mandatory water use reduction by 5%	No	$66	10	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
355	**Drought Management**	WEST TRAVIS COUNTY PUA	Mandatory water use reduction by 20%	Yes	$66	2,227	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
356	**Conservation**	WEST TRAVIS COUNTY PUA	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$1,003.00	9,370	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
357	**Direct Reuse**	WEST TRAVIS COUNTY PUA	Direct reuse of wastewater effluent.	Yes	$121	224	2030	Colorado	No	1	0	1	0	1	1	0	0	1	0	0	0	5
358	**Direct Potable Reuse**	WEST TRAVIS COUNTY PUA	Directly treat reclaimed water for potable use within the municipality.	Yes	$2,893	336	2030	Colorado	No	-1	0	1	1	0	1	-1	0	1	0	0	0	2
359	**Groundwater Importation (Hays County Pipeline)**	WEST TRAVIS COUNTY PUA	Importation of groundwater from the Carrizo-Wilcox aquifer in Gonzales County (Region L) through a pipeline. Region L pipeline runs from delivery point near Kyle to the Wimberley area in Hays County. Region K pipeline will run from a to-	Yes	$774	3,000	2030	Colorado	No	0	0	-1	0	0	-1	0	0	0	0	0	0	-2
360	**LCRA Contract Amendment with Infrastructure**	WEST TRAVIS COUNTY PUA	Amend existing contract with LCRA for additional supply for Hays and Travis counties	Yes	$782	5,500	2030	Colorado	No	1	1	1	0	0	0	0	0	0	0	-1	0	2
361	**Drought Management**	WHARTON	Mandatory water use reduction by 20%	Yes	$66	366	2020	All	No	1	0	1	0	0	0	1	0	1	0	0	0	4
362	**Conservation**	WHARTON	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,087.00	151	2020	All	No	-1	0	1	0	0	0	0	0	1	0	0	0	1
363	**Wharton Water Supply**	WHARTON	Expand use of Gulf Coast aquifer in Brazos-Colorado Basin of Wharton County	No	$272	3,000	2030	Brazos-Colorado	No	1	-1	1	0	0	1	0	0	0	0	0	0	2
364	**Drought Management**	WHARTON COUNTY WCID 2	Mandatory water use reduction by 20%	No	$66	87	2020	Brazos-Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
365	**Conservation**	WHARTON COUNTY WCID 2	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	No	$1,794.00	101	2020	Brazos-Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1

Table 5A-2: Region K Potentially Feasible Water Management Strategy Screening (for 2021 Region K Plan)

	Water Management Strategy	Water User Group or Wholesale Provider	Strategy Description	Addressing a Need?	Cost of Water ($/ac-ft)	Max Yield (ac-ft/yr)	Starting Decade	Basin	Interbasin Transfer (Yes/No)	Screening Matrix Factors (Positive (1), Neutral (0), Negative (-1))												Total of Screening Factors
										Cost	Yield	Location	Water Quality	Environmental and Natural Resources	Local Preference	Institutional Constraints	Socioeconomic Impacts	Impacts on Water Resources	Impacts on Agricultural Resources	Impacts to Recreation	Impacts on Other Management Strategies	
366	**Drought Management**	WILLIAMSON COUNTY WSID 3	Mandatory water use reduction by 20%	No	$66	20	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
367	**Drought Management**	WILLIAMSON TRAVIS COUNTIES MUD 1	Mandatory water use reduction by 20%	No	$66	22	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
368	**New Water Purchase**	WINDERMERE	Water purchase from Blue Water	Yes	$1,167	2,016	2030	Colorado	No	-1	1	1	0	0	1	0	0	1	0	0	0	3
369	**Drought Management**	WINDERMERE UTILITY	Mandatory water use reduction by 20%	Yes	$66	560	2020	Colorado	No	1	0	1	0	0	0	1	0	1	0	0	0	4
370	**Conservation**	WINDERMERE UTILITY	Conservation efforts of 10% per decade GPCD reduction for >140 GPCD	Yes	$2,218.00	118	2020	Colorado	No	-1	0	1	0	0	0	0	0	1	0	0	0	1

Examples of Consideration for Each Screening Matrix Factor (not entirely inclusive)

Cost - Comparison of cost per acre-foot (0-500, 500-1,000, 1,000+)
Yield - Is the yield appropriate to the demand (not overkill or otherwise)?
Location - Proximity to demand center (in basin and in region)
Water Quality - Any concerns about the quality of the water provided?
Environmental and Natural Resources Impact - Impact on habitat, land use, in-stream and B&E flow, etc.
Local Preference - Do we have an active sponsor, is there opposition?
Institutional constraints - Are there legal, regulatory, technology limits?
Impacts on water resources - Effect on other water supplies (groundwater or surface water)?
Impacts on agricultural resources - Effect on commercial agricultural activities?
Impacts on recreation - Are recreational activities impacted?
Impacts on mgt strategies - Does this affect another strategy (may be positive)?

APPENDIX 5B

RECOMMENDED AND ALTERNATIVE WATER MANAGEMENT STRATEGY TABLES

Recommended Water Management Strategy Summary Table

Region	ID	Recommended Water Management Strategy	Total Capital Costs ($)	Estimated Annual Average Unit Cost ($/ac-ft/yr)	Water Supply Volume (ac-ft/yr)					
					2020	2030	2040	2050	2060	2070
K	K1	Austin Return Flows	$0	$11	0	223	345	475	542	600
K	K2	Downstream Return Flows	$0	$11	560	560	560	560	560	560
K	K3	LCRA Enhanced Municipal and Industrial Conservation	$74,415,000	$262	5,100	9,700	15,000	20,000	20,000	20,000
K	K4	Austin Conservation	$719,616,000	$1,343	4,910	14,890	24,870	30,120	35,370	40,620
K	K5	Municipal Conservation	$205,751,210	$324 - $5,140	7,994	14,456	21,090	28,080	34,602	39,912
K	K6	Mining Conservation	$0	$16 - $33	1,302	1,543	1,608	1,533	1,300	1,800
K	K7	Irrigation Conservation	$203,685,998	$103 - $643	50,585	65,760	81,862	95,698	107,271	118,856
K	K8	LCRA Amendments to Water Management Plan - Interruptible Water	$0	$60	63,495	25,797	13,105	0	0	0
K	K9	Amendments to Water Rights and Acquisition of New Water Rights	$125,000	$500	0	250	250	250	250	250
K	K10	LCRA Contract Amendments	$0	$145	12,600	5,700	6,100	9,800	13,150	13,320
K	K11	LCRA Contract Amendments with Infrastructure	$35,402,000	$782	0	7,400	8,400	10,600	10,600	11,500
K	K12	New LCRA Contracts	$0	$145	0	0	6,320	6,520	6,720	6,720
K	K13	New LCRA Contracts with Infrastructure	$178,936,000	$914 - $1,961	0	3,200	7,900	12,400	20,400	31,600
K	K14	LCRA Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)	$331,000	$833	0	30	30	30	30	30
K	K15	LCRA Import Return Flows from Williamson County	$75,734,000	$243	0	5,460	10,920	16,380	21,840	25,000
K	K16	LCRA Baylor Creek Reservoir	$219,883,000	$907	0	0	18,000	18,000	18,000	18,000
K	K17	LCRA Aquifer Storage and Recovery (ASR) Carrizo-Wilcox	$146,592,000	$1,300	0	0	12,973	12,973	12,973	12,973
K	K18	LCRA Enhanced Recharge (MAR)	$71,125,000	$375	0	0	14,486	14,486	14,486	14,486
K	K19	LCRA Mid-Basin Reservoir	$512,792,000	$2,350	0	20,000	20,000	20,000	20,000	20,000
K	K20	LCRA Excess Flows Reservoir	$540,110,000	$1,241	0	39,247	39,247	39,247	39,247	39,247
K	K21	LCRA Prairie Site Conservation Reservoir	$16,690,000	$50	0	19,000	9,500	0	0	0
K	K22	Austin Blackwater and Greywater Reuse	$0	$0	0	1,450	3,450	5,400	7,340	9,290
K	K23	Austin Aquifer Storage and Recovery	$370,527,000	$2,234	0	0	7,900	10,500	13,200	15,800

Recommended Water Management Strategy Summary Table

Region	ID	Recommended Water Management Strategy	Total Capital Costs ($)	Estimated Annual Average Unit Cost ($/ac-ft/yr)	Water Supply Volume (ac-ft/yr)					
					2020	2030	2040	2050	2060	2070
K	K24	Austin Off-Channel Reservoir and Evaporation Suppression	$334,642,000	$1,018	0	0	0	0	0	25,827
K	K25	Austin Onsite Rainwater and Stormwater Harvesting	$0	$0	0	790	1,880	2,890	3,890	4,900
K	K26	Austin Community Scale Stormwater Harvesting	$0	$0	0	66	158	184	210	236
K	K27	Austin Brackish Groundwater Desalination	$167,689,000	$2,995	0	0	0	0	0	5,000
K	K28	Austin Centralized Direct Non-Potable Reuse	$286,031,000	$995	500	2,990	10,250	14,583	18,917	23,250
K	K29	Austin Decentralized Direct Non-Potable Reuse	$5,811,000	$48	0	1,400	4,160	8,330	12,510	16,680
K	K30	Austin Capture Local Inflows to Lady Bird Lake	$0	$331	0	0	3,000	3,000	3,000	3,000
K	K31	Austin Indirect Potable Reuse through Lady Bird Lake	$35,839,000	$457	0	0	11,000	14,000	17,000	20,000
K	K32	Austin Longhorn Dam Operations Improvements	$15,211,000	$393	0	3,000	3,000	3,000	3,000	3,000
K	K33	Austin Lake Austin Operations	$0	$218	2,500	2,500	2,500	2,500	2,500	2,500
K	K34	Expansion of Current Groundwater Supplies - Carrizo-Wilcox Aquifer	$9,163,000	$80 - $1,001	0	300	350	550	850	850
K	K35	Expansion of Current Groundwater Supplies - Edwards (BFZ) Aquifer	$0	$50 - $120	0	0	70	70	70	70
K	K36	Expansion of Current Groundwater Supplies - Ellenburger-San Saba Aquifer	$27,926,000	$70 - $1,235	0	1,850	3,100	3,100	3,100	3,100
K	K37	Expansion of Current Groundwater Supplies - Gulf Coast Aquifer	$36,832,000	$49 - $1,218	13,951	17,159	17,178	17,199	17,199	17,199
K	K38	Expansion of Current Groundwater Supplies - Sparta Aquifer	$2,638,000	$1,127	0	40	98	145	180	204

Recommended Water Management Strategy Summary Table

Region	ID	Recommended Water Management Strategy	Total Capital Costs ($)	Estimated Annual Average Unit Cost ($/ac-ft/yr)	Water Supply Volume (ac-ft/yr) 2020	2030	2040	2050	2060	2070
K	K39	Expansion of Current Groundwater Supplies - Trinity Aquifer	$14,948,000	$85 - $1,180	900	900	1,200	1,207	1,226	2,150
K	K40	Expansion of Current Groundwater Supplies - Yegua-Jackson Aquifer	$5,463,000	$567	760	760	0	0	0	0
K	K41	Development of New Groundwater Supplies - Ellenburger-San Saba Aquifer	$4,495,000	$534	0	0	0	300	400	700
K	K42	Development of New Groundwater Supplies - Gulf Coast Aquifer	$1,195,000	$180	510	510	510	510	510	510
K	K43	Development of New Groundwater Supplies - Hickory Aquifer	$4,863,000	$432	0	1,000	1,000	1,000	1,000	1,000
K	K44	Development of New Groundwater Supplies - Marble Falls Aquifer	$3,345,000	$307	0	0	1,000	1,000	1,000	1,000
K	K45	Development of New Groundwater Supplies - Sparta Aquifer	$6,056,000	$1,693	400	400	400	400	400	400
K	K46	Development of New Groundwater Supplies - Trinity Aquifer	$27,613,000	$953 - $3,830	0	200	500	500	1,500	2,325
K	K47	Development of New Groundwater Supplies - Yegua-Jackson Aquifer	$16,846,000	$1,887 - $3,960	0	800	800	800	800	800
K	K48	Hays County Pipeline	$29,942,000	$2,119	0	4,000	4,000	4,000	4,000	4,000
K	K49	Alliance Regional Water Authority Pipeline	$21,965,000	$1,106	0	762	1,829	1,829	2,113	2,113
K	K50	BS/EACD Edwards/Middle Trinity ASR	$24,972,000	$1,398 - $3,842	150	1,324	1,324	1,324	1,324	1,324
K	K51	BS/EACD Saline Edwards Desalination and ASR	$16,664,000	$1,951	0	0	1,300	1,300	1,300	1,300
K	K52	Buena Vista Regional Project	$28,886,000	$1,136	0	2,065	4,884	4,884	4,884	4,884
K	K53	East Lake Buchanan Regional Project	$11,925,000	$1,957	0	498	935	935	935	935
K	K54	Marble Falls Regional Project	$56,608,000	$1,436	0	5,578	5,578	5,578	5,578	5,578
K	K55	Rainwater Harvesting	$0	$0	0	55	74	95	118	142
K	K56	Water Purchase	$213,000	$1,167 - $45,619	267	790	1,525	1,560	1,830	2,100
K	K57	Brush Management	$29,707,000	$1,190	0	1,999	1,999	1,999	1,999	1,999

Recommended Water Management Strategy Summary Table

Region	ID	Recommended Water Management Strategy	Total Capital Costs ($)	Estimated Annual Average Unit Cost ($/ac-ft/yr)	Water Supply Volume (ac-ft/yr)					
					2020	2030	2040	2050	2060	2070
K	K58	Drought Management - Municipalities	$0	$66	32,804	36,630	40,260	44,006	48,336	53,100
K	K59	Drought Management - Irrigation	$0	$168 - $777	34,153	33,234	32,340	31,470	30,624	29,800
K	K60	Direct Potable Reuse	$63,825,000	$1,964 - $3,764	0	3,416	3,416	3,416	3,416	3,416
K	K61	Direct Reuse (Non-Potable)	$27,392,000	$0 - $5,977	175	3,525	3,807	4,540	5,382	5,666
K	K62	Blend Brackish Surface Water in STPNOC Reservoir	$0	$0	3,000	3,000	3,000	3,000	3,000	3,000
K	K63	Alternate Canal Delivery	$6,158,000	$183	0	12,727	12,727	12,727	12,727	12,727

Alternative Water Management Strategy Summary Table

Region	ID	Alternative Water Management Strategy	Total Project Costs ($)	Estimated Annual Average Unit Cost ($/ac-ft/yr)	Water Supply Volume (ac-ft/yr)					
					2020	2030	2040	2050	2060	2070
K	KA1	LCRA Ezpand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)	$38,139,000	$190	0	25000	25,000	25,000	25,000	25,000
K	KA2	LCRA Brackish Groundwater Desalination from the Gulf Coast Aquifer	$229,006,000	$1,393	0	0	22,400	22,400	22,400	22,400
K	KA3	LCRA Supplement Bay and Estuary Inflows with Brackish Groundwater	$47,269,000	$532	0	12,000	12,000	12,000	12,000	12,000
K	KA4	Expanded Local Use of Groundwater - Carrizo-Wilcox Aquifer (Aqua WSC)	$37,682,000	$221	0	5,500	5,500	5,500	13,385	19,121

APPENDIX 5C

MUNICIPAL CONSERVATION TARGET GPCD GOALS

			Region K Gallons per Capita per Day (GPCD) Projections						Conservation Gallons per Capita per Day (GPCD) Projections						Conservation Demand Reduction (AFY)					
WUG Name	County	Basin	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
AQUA WSC	BASTROP	Brazos	147	143	141	140	140	140	140	140	140	140	140	140	4	2	1	0	-	-
AQUA WSC	BASTROP	Colorado	147	143	141	140	140	140	140	140	140	140	140	140	408	244	116	33	-	-
AQUA WSC	BASTROP	Guadalupe	147	143	141	140	140	140	140	140	140	140	140	140	3	2	1	0	-	-
BASTROP	BASTROP	Colorado	165	161	159	158	158	158	150	140	140	140	140	140	184	355	433	558	744	992
COUNTY-OTHER, BASTROP	BASTROP	Brazos	162	160	159	158	158	158	148	140	140	140	140	140	1	1	1	2	2	2
COUNTY-OTHER, BASTROP	BASTROP	Colorado	162	160	159	158	158	158	148	140	140	140	140	140	124	198	219	255	307	381
COUNTY-OTHER, BASTROP	BASTROP	Guadalupe	162	160	159	158	158	158	148	140	140	140	140	140	3	5	5	6	8	9
ELGIN	BASTROP	Colorado	125	122	120	119	119	119	119	113	107	102	102	102	66	119	224	405	531	700
SMITHVILLE	BASTROP	Colorado	153	148	146	145	145	145	140	140	140	140	140	140	69	59	54	59	75	97
BLANCO	BLANCO	Guadalupe	131	127	125	124	124	124	131	118	118	118	118	118	-	27	23	21	21	21
JOHNSON CITY	BLANCO	Colorado	154	150	148	147	147	147	140	140	140	140	140	140	31	28	25	23	23	23
BERTRAM	BURNET	Brazos	218	214	212	211	211	211	198	178	160	144	140	140	39	85	142	205	238	257
BURNET	BURNET	Brazos	200	196	195	194	193	193	182	164	147	140	140	140	1	1	2	3	3	3
BURNET	BURNET	Colorado	200	196	195	194	193	193	182	164	147	140	140	140	149	329	543	691	754	810
COTTONWOOD SHORES	BURNET	Colorado	157	154	152	151	151	151	143	140	140	140	140	140	22	26	27	28	29	32
COUNTY-OTHER, BURNET	BURNET	Brazos	137	134	132	131	131	131	130	125	125	125	125	125	63	91	71	68	70	74
COUNTY-OTHER, BURNET	BURNET	Colorado	137	134	132	131	131	131	130	125	125	125	125	125	112	162	127	122	125	131
GEORGETOWN	BURNET	Brazos	198	194	193	193	193	192	180	162	146	140	140	140	8	17	28	35	39	41
HORSESHOE BAY	BURNET	Colorado	410	407	405	404	404	404	374	336	303	272	245	221	49	134	241	368	505	645
KEMPNER WSC	BURNET	Brazos	155	153	151	150	150	149	141	140	140	140	140	140	12	12	11	11	12	12
MARBLE FALLS	BURNET	Colorado	239	235	233	233	233	233	218	196	176	159	143	140	212	567	1,193	1,801	2,387	2,566
MEADOWLAKES	BURNET	Colorado	299	296	295	294	293	293	273	245	221	199	179	161	77	145	210	271	326	377
COLUMBUS	COLORADO	Colorado	264	260	257	255	255	255	240	216	195	175	158	142	102	195	286	384	484	581
WEIMAR	COLORADO	Colorado	205	201	197	196	196	195	186	168	151	140	140	140	15	27	40	50	51	53
WEIMAR	COLORADO	Lavaca	205	201	197	196	196	195	186	168	151	140	140	140	30	56	82	102	105	108
FAYETTE COUNTY WCID MONUMENT HILL	FAYETTE	Colorado	216	213	210	209	209	209	197	177	159	143	140	140	17	33	50	68	75	78
FLATONIA	FAYETTE	Guadalupe	186	182	179	178	178	177	170	153	140	140	140	140	6	12	17	17	18	19
FLATONIA	FAYETTE	Lavaca	186	182	179	178	178	177	170	153	140	140	140	140	25	51	73	75	78	80
LA GRANGE	FAYETTE	Colorado	156	152	149	148	148	148	142	140	140	140	140	140	86	82	69	63	64	66
SCHULENBURG	FAYETTE	Lavaca	199	195	192	191	191	190	181	163	147	140	140	140	63	128	199	235	246	254
FREDERICKSBURG	GILLESPIE	Colorado	248	244	242	240	240	240	226	203	183	165	148	140	302	598	903	1,234	1,578	1,802
AUSTIN	HAYS	Colorado	156	154	154	154	154	154	140	126	126	126	126	126	19	150	237	375	550	792
BUDA	HAYS	Colorado	161	158	158	157	157	157	146	140	140	140	140	140	159	292	382	499	636	793
DRIPPING SPRINGS WSC	HAYS	Colorado	157	154	153	152	152	152	143	140	140	140	140	140	174	289	339	417	522	576
HAYS COUNTY WCID 1	HAYS	Colorado	201	198	196	195	195	195	183	165	148	140	140	140	74	136	196	226	225	225
HAYS COUNTY WCID 2	HAYS	Colorado	208	205	203	202	202	202	189	170	153	140	140	140	26	62	114	169	211	259
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	HAYS	Colorado	314	312	311	311	311	311	286	257	232	208	188	169	405	984	1,610	2,546	3,631	4,840
HORSESHOE BAY	LLANO	Colorado	410	407	405	404	404	404	374	336	303	272	245	221	204	406	574	746	887	1,000
LLANO	LLANO	Colorado	216	212	209	207	207	207	196	177	159	143	140	140	78	147	208	263	285	295
MATAGORDA WASTE DISPOSAL & WSC	MATAGORDA	Brazos-Colorado	164	159	156	154	154	154	149	140	140	140	140	140	5	6	5	5	5	5
MATAGORDA WASTE DISPOSAL & WSC	MATAGORDA	Colorado	164	159	156	154	154	154	149	140	140	140	140	140	7	10	8	7	8	8
GOLDTHWAITE	MILLS	Brazos	172	168	165	163	163	163	157	141	140	140	140	140	1	2	2	2	2	2
GOLDTHWAITE	MILLS	Colorado	172	168	165	163	163	163	157	141	140	140	140	140	35	63	59	57	59	61
NORTH SAN SABA WSC	SAN SABA	Colorado	255	251	249	249	249	248	232	209	188	169	152	140	17	32	46	60	74	85
RICHLAND SUD	SAN SABA	Colorado	209	206	203	202	201	202	190	171	154	140	140	140	20	39	55	69	70	72
SAN SABA	SAN SABA	Colorado	310	306	304	302	302	302	282	254	228	206	185	167	106	208	300	378	469	556
AQUA WSC	TRAVIS	Colorado	147	143	141	140	140	140	140	140	140	140	140	140	49	26	10	3	-	-
AUSTIN	TRAVIS	Colorado	156	154	154	154	154	154	142	140	140	140	140	140	15,362	18,091	20,977	22,961	24,541	26,684
BARTON CREEK WEST WSC	TRAVIS	Colorado	291	289	287	286	285	285	265	238	215	193	174	156	39	76	109	139	167	193
BARTON CREEK WSC	TRAVIS	Colorado	666	664	662	662	661	661	606	546	491	442	398	358	47	110	183	258	330	409
CEDAR PARK	TRAVIS	Colorado	184	183	182	182	182	182	168	151	140	140	140	140	203	420	590	586	583	582
COUNTY-OTHER, TRAVIS (AQUA TEXAS - RIVERCREST)	TRAVIS	Colorado	366	363	361	360	360	360	333	299	270	243	218	196	29	55	79	102	123	142
CREEDMOOR-MAHA WSC	TRAVIS	Colorado	99	95	92	90	90	90	94	89	85	81	81	81	30	37	55	86	93	100
CREEDMOOR-MAHA WSC	TRAVIS	Guadalupe	99	95	92	90	90	90	94	89	85	81	81	81	2	2	4	6	6	6
CYPRESS RANCH WCID 1	TRAVIS	Colorado	88	84	83	82	82	81	83	79	75	71	71	71	6	9	14	20	21	20
ELGIN	TRAVIS	Colorado	125	122	120	119	119	119	119	113	107	102	102	102	13	25	47	81	94	107
HURST CREEK MUD	TRAVIS	Colorado	496	493	491	490	490	490	451	406	365	329	296	266	155	302	437	560	673	776
JONESTOWN WSC	TRAVIS	Colorado	153	150	148	147	147	147	140	140	140	140	140	140	56	47	41	39	40	41
KELLY LANE WCID 1	TRAVIS	Colorado	170	167	165	165	164	164	155	140	140	140	140	140	29	52	48	47	46	46
LAGO VISTA	TRAVIS	Colorado	220	218	216	216	215	215	200	180	162	146	140	140	168	375	622	914	1,098	1,198

			Region K Gallons per Capita per Day (GPCD) Projections						Conservation Gallons per Capita per Day (GPCD) Projections						Conservation Demand Reduction (AFY)					
WUG Name	**County**	**Basin**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
LAKEWAY MUD	TRAVIS	Colorado	226	223	221	220	220	220	205	185	166	150	140	140	248	492	748	1,015	1,169	1,168
LOOP 360 WSC	TRAVIS	Colorado	524	522	520	519	519	519	477	429	386	348	313	282	110	225	339	450	559	679
OAK SHORES WATER SYSTEM	TRAVIS	Colorado	245	242	240	239	239	239	223	201	181	163	146	140	14	29	42	54	65	70
PFLUGERVILLE	TRAVIS	Colorado	148	146	146	145	145	145	140	140	140	140	140	140	563	549	606	674	754	743
ROLLINGWOOD	TRAVIS	Colorado	241	237	233	231	231	231	219	197	177	160	144	140	34	64	90	116	142	148
ROUGH HOLLOW IN TRAVIS COUNTY	TRAVIS	Colorado	190	190	190	190	190	190	173	156	140	140	140	140	53	220	319	319	319	319
ROUND ROCK	TRAVIS	Colorado	143	140	139	139	139	138	140	140	139	139	139	138	6	1	-	-	-	-
SENNA HILLS MUD	TRAVIS	Colorado	308	305	303	302	302	302	280	252	227	204	184	165	38	85	142	200	258	321
SHADY HOLLOW MUD	TRAVIS	Colorado	162	158	155	153	153	153	148	140	140	140	140	140	71	90	74	65	64	64
SUNSET VALLEY	TRAVIS	Colorado	353	350	349	348	349	348	321	289	260	234	211	190	33	73	123	183	256	343
TRAVIS COUNTY MUD 10	TRAVIS	Colorado	190	189	186	186	185	185	173	155	140	140	140	140	7	15	25	27	28	30
TRAVIS COUNTY MUD 4	TRAVIS	Colorado	547	546	546	545	545	545	498	448	404	363	327	294	135	309	507	731	962	1,198
TRAVIS COUNTY WCID 10	TRAVIS	Colorado	410	406	403	402	402	402	373	335	302	272	244	220	315	660	1,031	1,440	1,858	2,275
TRAVIS COUNTY WCID 17	TRAVIS	Colorado	228	226	225	225	224	224	207	187	168	151	140	140	843	1,748	2,794	3,658	4,317	4,451
TRAVIS COUNTY WCID 18	TRAVIS	Colorado	151	147	145	144	144	144	140	140	140	140	140	140	75	58	47	43	43	46
TRAVIS COUNTY WCID 19	TRAVIS	Colorado	588	585	583	581	581	581	535	481	433	390	351	316	40	79	114	146	176	203
TRAVIS COUNTY WCID 20	TRAVIS	Colorado	461	459	457	456	456	456	420	378	340	306	275	248	53	103	149	190	228	263
TRAVIS COUNTY WCID POINT VENTURE	TRAVIS	Colorado	220	217	215	214	214	214	200	180	162	146	140	140	23	55	94	146	189	216
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	TRAVIS	Colorado	314	312	311	311	311	311	286	257	232	208	188	169	603	1,295	2,034	2,914	3,729	4,530
WINDERMERE UTILITY	TRAVIS	Colorado	146	143	141	141	140	140	140	140	140	140	140	140	118	62	29	13	8	7
WHARTON	WHARTON	Brazos-Colorado	159	155	151	150	150	150	145	140	140	140	140	140	83	91	73	67	68	69
WHARTON	WHARTON	Colorado	159	155	151	150	150	150	145	140	140	140	140	140	68	74	60	55	55	57
WHARTON COUNTY WCID 2	WHARTON	Brazos-Colorado	182	178	175	173	173	173	166	149	140	140	140	140	41	76	97	96	99	101

APPENDIX 5D

WATER MANAGEMENT STRATEGY COST SUMMARY TABLES

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining, Bastrop County, Guadalupe Basin - Mining Conservation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (60724 kW-hr @ 0.08 $/kW-hr)	$5,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$5,000**
Available Project Yield (acft/yr)	308
Annual Cost of Water ($ per acft), based on PF=1	$16
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$16
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.05
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.05
JB	*10/1/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining, Burnet County, Colorado Basin - Mining Conservation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (753227 kW-hr @ 0.08 $/kW-hr)	$60,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$60,000**
Available Project Yield (acft/yr)	1,800
Annual Cost of Water ($ per acft), based on PF=1	$33
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$33
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.10
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.10

JB *10/1/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Multiple - Irrigation Conservation - On-Farm Conservation

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
TOTAL COST OF FACILITIES	**$46,249,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$16,187,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,717,000
TOTAL COST OF PROJECT	**$64,153,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$4,514,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$462,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$4,976,000**
Available Project Yield (acft/yr)	44,106
Annual Cost of Water ($ per acft), based on PF=1	$113
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$10
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.35
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.03

Alicia Smiley/Jaime Burke *9/27/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Multiple - Irrigation Conservation - Irrigation Operations Conveyance Improvements

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$72,798,000
TOTAL COST OF FACILITIES	**$72,798,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$25,479,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$2,703,000
TOTAL COST OF PROJECT	**$100,980,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$7,105,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (2% of Cost of Facilities)	$1,456,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$8,561,000**
Available Project Yield (acft/yr)	44,350
Annual Cost of Water ($ per acft), based on PF=1	$193
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$33
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.59
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.10

Note: One or more cost element has been calculated externally

Alicia Smiley/Jaime Burke *10/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Multiple - Irrigation Conservation - Sprinkler Irrigation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$8,527,000
TOTAL COST OF FACILITIES	**$8,527,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,985,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$317,000
TOTAL COST OF PROJECT	**$11,829,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$832,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (15% of Cost of Facilities)	$1,279,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,111,000**
Available Project Yield (acft/yr)	11,393
Annual Cost of Water ($ per acft), based on PF=1	$185
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$112
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.57
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.34

Alicia Smiley/Jaime Burke *10/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Multiple - Irrigation Conservation - Real-Time Use Metering & Monitoring

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$18,000,000
TOTAL COST OF FACILITIES	**$18,000,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$6,300,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$669,000
TOTAL COST OF PROJECT	**$24,969,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,757,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (2% of Cost of Facilities)	$360,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,117,000**
Available Project Yield (acft/yr)	20,508
Annual Cost of Water ($ per acft), based on PF=1	$103
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$18
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.05
Alicia Smiley/Jaime Burke	*10/22/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation, Mills - Irrigation Conservation - Drip Irrigation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
TOTAL COST OF FACILITIES	**$618,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$216,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$23,000
TOTAL COST OF PROJECT	**$857,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$60,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (30% of Cost of Facilities)	$185,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$245,000**
Available Project Yield (acft/yr)	459
Annual Cost of Water ($ per acft), based on PF=1	$534
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$403
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.64
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.24

Alicia Smiley/Jaime Burke *9/23/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation, Gillespie - Irrigation Conservation - Drip Irrigation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
TOTAL COST OF FACILITIES	**$46,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$16,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$2,000
TOTAL COST OF PROJECT	**$64,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$4,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (30% of Cost of Facilities)	$14,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$18,000**
Available Project Yield (acft/yr)	28
Annual Cost of Water ($ per acft), based on PF=1	$643
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$500
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.97
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.53

Alicia Smiley/Jaime Burke *1/21/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation, San Saba - Irrigation Conservation - Drip Irrigation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
TOTAL COST OF FACILITIES	**$601,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$210,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$23,000
TOTAL COST OF PROJECT	**$834,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$59,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (30% of Cost of Facilities)	$180,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$239,000**
Available Project Yield (acft/yr)	626
Annual Cost of Water ($ per acft), based on PF=1	$382
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$288
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.17
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.88

Alicia Smiley/Jaime Burke *1/21/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - LCRA Enhanced Municipal and Industrial Conservation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$53,647,000
TOTAL COST OF FACILITIES	**$53,647,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$18,776,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,992,000
TOTAL COST OF PROJECT	**$74,415,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$5,236,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (0% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$5,236,000**
Available Project Yield (acft/yr)	20,000
Annual Cost of Water ($ per acft), based on PF=1	$262
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$0
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.80
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.00

Note: One or more cost element has been calculated externally

KB *9/24/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
West Travis County PUA - LCRA Contract Amendment with Infrastructure

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$16,670,000
Transmission Pipeline (0 in dia., miles)	$2,079,000
Transmission Pump Station(s) & Storage Tank(s)	$6,750,000
TOTAL COST OF FACILITIES	**$25,499,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$8,821,000
Environmental & Archaeology Studies and Mitigation	$82,000
Land Acquisition and Surveying (7 acres)	$52,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$948,000
TOTAL COST OF PROJECT	**$35,402,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,491,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$35,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$549,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (5340016 kW-hr @ 0.08 $/kW-hr)	$427,000
Purchase of Water (5500 acft/yr @ 145 $/acft)	$798,000
TOTAL ANNUAL COST	**$4,300,000**
Available Project Yield (acft/yr)	5,500
Annual Cost of Water ($ per acft), based on PF=2	$782
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$329
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$2.40
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.01

Kiera Brown *9/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Aqua WSC, Bastrop, Bastrop County WCID #2 - New LCRA Contract w/ Infrastructure

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (18.8 MGD)	$23,150,000
Transmission Pipeline (36 in dia., miles)	$9,407,000
Water Treatment Plant (24 MGD)	$88,630,000
TOTAL COST OF FACILITIES	**$121,187,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$41,945,000
Environmental & Archaeology Studies and Mitigation	$433,000
Land Acquisition and Surveying (40 acres)	$276,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$4,506,000
TOTAL COST OF PROJECT	**$168,347,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$11,845,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$94,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$579,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$6,204,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (11187112 kW-hr @ 0.08 $/kW-hr)	$895,000
Purchase of Water (25500 acft/yr @ 145 $/acft)	$3,698,000
TOTAL ANNUAL COST	**$23,315,000**
Available Project Yield (acft/yr)	25,500
Annual Cost of Water ($ per acft), based on PF=1	$914
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$450
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.81
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.38

Kiera Brown *10/1/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Smithville - New LCRA Contract with Infrastructure

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$3,097,000
Transmission Pipeline (0 in dia., miles)	$105,000
Water Treatment Plant (0.6 MGD)	$4,371,000
TOTAL COST OF FACILITIES	**$7,573,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,645,000
Environmental & Archaeology Studies and Mitigation	$46,000
Land Acquisition and Surveying (6 acres)	$41,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$284,000
TOTAL COST OF PROJECT	**$10,589,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$745,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$77,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$437,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (140990 kW-hr @ 0.08 $/kW-hr)	$11,000
Purchase of Water (700 acft/yr @ 145 $/acft)	$102,000
TOTAL ANNUAL COST	**$1,373,000**
Available Project Yield (acft/yr)	700
Annual Cost of Water ($ per acft), based on PF=1	$1,961
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$897
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.02
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.75

Kiera Brown *10/1/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Expand Use of Groundwater in Bastrop County (Carrizo-Wilcox Aquifer)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$174,000
TOTAL COST OF FACILITIES	**$174,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$61,000
Environmental & Archaeology Studies and Mitigation	$46,000
Land Acquisition and Surveying (6 acres)	$41,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$9,000
TOTAL COST OF PROJECT	**$331,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$23,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$2,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (4426 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (30 acft/yr @ 11.4 $/acft)	$0
TOTAL ANNUAL COST	**$25,000**
Available Project Yield (acft/yr)	30
Annual Cost of Water ($ per acft), based on PF=1	$833
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$67
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.56
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.20

Kiera Brown *8/20/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Import Return Flows from Williamson County

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$8,177,000
Transmission Pipeline (0 in dia., miles)	$34,359,000
Storage Tanks (Other Than at Booster Pump Stations)	$3,054,000
Water Treatment Plant (0 MGD)	$8,651,000
TOTAL COST OF FACILITIES	**$54,241,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$17,266,000
Environmental & Archaeology Studies and Mitigation	$444,000
Land Acquisition and Surveying (26 acres)	$1,756,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$2,027,000
TOTAL COST OF PROJECT	**$75,734,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$5,329,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$374,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$204,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2161821 kW-hr @ 0.08 $/kW-hr)	$173,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$6,080,000**
Available Project Yield (acft/yr)	25,000
Annual Cost of Water ($ per acft), based on PF=1.5	$243
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.5	$30
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.5	$0.75
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.5	$0.09

Note: One or more cost element has been calculated externally

Erin Hynes *10/18/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Baylor Creek Reservoir

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Off-Channel Storage/Ring Dike (Conservation Pool 48390 acft, acres)	$49,308,000
Primary Pump Station (0 MGD)	$39,456,000
Transmission Pipeline (0 in dia., miles)	$63,296,000
TOTAL COST OF FACILITIES	**$152,060,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$50,056,000
Environmental & Archaeology Studies and Mitigation	$11,661,000
Land Acquisition and Surveying (33 acres)	$220,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$5,886,000
TOTAL COST OF PROJECT	**$219,883,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$9,816,000
Reservoir Debt Service (3.5 percent, 40 years)	$3,764,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$633,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$986,000
Dam and Reservoir (1.5% of Cost of Facilities)	$740,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (4921943 kW-hr @ 0.08 $/kW-hr)	$394,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$16,333,000**
Available Project Yield (acft/yr)	18,000
Annual Cost of Water ($ per acft), based on PF=1	$907
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$153
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.78
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.47

Note: One or more cost element has been calculated externally

Kiera Brown *8/22/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - ASR in Carrizo-Wilcox Aquifer

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$17,747,000
Transmission Pipeline (0 in dia., miles)	$6,028,000
Well Fields (Wells, Pumps, and Piping)	$14,845,000
Storage Tanks (Other Than at Booster Pump Stations)	$4,351,000
Water Treatment Plant (16 MGD)	$62,227,000
TOTAL COST OF FACILITIES	**$105,198,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$36,518,000
Environmental & Archaeology Studies and Mitigation	$550,000
Land Acquisition and Surveying (63 acres)	$402,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$3,924,000
TOTAL COST OF PROJECT	**$146,592,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$10,314,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$252,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$444,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$4,356,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (18708533 kW-hr @ 0.08 $/kW-hr)	$1,497,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$16,863,000**
Available Project Yield (acft/yr)	12,973
Annual Cost of Water ($ per acft), based on PF=1	$1,300
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$505
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.99
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.55

JB *11/26/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - LCRA Enhanced Recharge and Conjunctive Use

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Off-Channel Storage/Ring Dike (Conservation Pool acft, 100 acres)	$12,930,000
Primary Pump Station (0 MGD)	$8,893,000
Transmission Pipeline (0 in dia., miles)	$383,000
Well Fields (Wells, Pumps, and Piping)	$21,812,000
Integration, Relocations, & Other	$3,267,000
TOTAL COST OF FACILITIES	**$47,285,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$19,551,000
Environmental & Archaeology Studies and Mitigation	$1,955,000
Land Acquisition and Surveying (20 acres)	$429,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,905,000
TOTAL COST OF PROJECT	**$71,125,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,708,000
Reservoir Debt Service (3.5 percent, 40 years)	$863,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$255,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$222,000
Dam and Reservoir (1.5% of Cost of Facilities)	$194,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2323195 kW-hr @ 0.08 $/kW-hr)	$186,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$5,428,000**
Available Project Yield (acft/yr)	14,486
Annual Cost of Water ($ per acft), based on PF=1	$375
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$59
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.18

Note: One or more cost element has been calculated externally

JB *11/26/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Mid-Basin Off Channel Reservoir

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Off-Channel Storage/Ring Dike (Conservation Pool 40000 acft, 2500 acres)	$107,625,000
Intake Pump Stations (35.7 MGD)	$67,981,000
Transmission Pipeline (36 in dia., miles)	$70,997,000
Transmission Pump Station(s) & Storage Tank(s)	$109,442,000
TOTAL COST OF FACILITIES	**$356,045,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$121,066,000
Environmental & Archaeology Studies and Mitigation	$11,497,000
Land Acquisition and Surveying (2587 acres)	$10,459,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$13,725,000
TOTAL COST OF PROJECT	**$512,792,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$24,128,000
Reservoir Debt Service (3.5 percent, 40 years)	$7,955,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$878,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$4,015,000
Dam and Reservoir (1.5% of Cost of Facilities)	$1,614,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (105039917 kW-hr @ 0.08 $/kW-hr)	$8,403,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$46,993,000**
Available Project Yield (acft/yr)	20,000
Annual Cost of Water ($ per acft), based on PF=2	$2,350
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$746
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$7.21
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.29

Note: One or more cost element has been calculated externally

Erin Hynes *10/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - LCRA Prairie Site Off-Channel Reservoir

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Off-Channel Storage/Ring Dike (Conservation Pool 2000 acft, 200 acres)	$7,235,000
Integration, Relocations, & Other	$3,000,000
TOTAL COST OF FACILITIES	**$10,235,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,582,000
Environmental & Archaeology Studies and Mitigation	$1,208,000
Land Acquisition and Surveying (206 acres)	$1,217,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$448,000
TOTAL COST OF PROJECT	**$16,690,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$293,000
Reservoir Debt Service (3.5 percent, 40 years)	$586,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (0% of Cost of Facilities)	$0
Intakes and Pump Stations (0% of Cost of Facilities)	$0
Dam and Reservoir (0.8% of Cost of Facilities)	$58,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (91605 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$944,000**
Available Project Yield (acft/yr)	19,000
Annual Cost of Water ($ per acft), based on PF=2	$50
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$3
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.01

Note: One or more cost element has been calculated externally

Kiera Brown *9/24/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Excess Flows Off Channel Reservoir

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Off-Channel Storage/Ring Dike (Conservation Pool 40000 acft, 2500 acres)	$107,625,000
Intake Pump Stations (35.7 MGD)	$68,211,000
Transmission Pipeline (36 in dia., miles)	$107,604,000
Transmission Pump Station(s) & Storage Tank(s)	$93,654,000
TOTAL COST OF FACILITIES	**$377,094,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$126,603,000
Environmental & Archaeology Studies and Mitigation	$11,497,000
Land Acquisition and Surveying (2587 acres)	$10,459,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$14,457,000
TOTAL COST OF PROJECT	**$540,110,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$26,050,000
Reservoir Debt Service (3.5 percent, 40 years)	$7,955,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,200,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$3,737,000
Dam and Reservoir (1.5% of Cost of Facilities)	$1,614,000
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (101968108 kW-hr @ 0.08 $/kW-hr)	$8,157,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$48,713,000**
Available Project Yield (acft/yr)	39,247
Annual Cost of Water ($ per acft), based on PF=2	$1,241
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$375
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.81
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.15

Note: One or more cost element has been calculated externally

Erin Hynes *11/4/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin, LCRA, and others - Austin Return Flows

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (15217037 kW-hr @ 0.08 $/kW-hr)	$1,217,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,217,000**
Available Project Yield (acft/yr)	114,129
Annual Cost of Water ($ per acft), based on PF=3	$11
Annual Cost of Water After Debt Service ($ per acft), based on PF=3	$11
Annual Cost of Water ($ per 1,000 gallons), based on PF=3	$0.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=3	$0.03

JB *11/8/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Conservation

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$514,560,000
TOTAL COST OF FACILITIES	**$514,560,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$180,096,000
Environmental & Archaeology Studies and Mitigation	$5,700,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$19,260,000
TOTAL COST OF PROJECT	**$719,616,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$50,633,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (0.7649% of Cost of Facilities)	$3,936,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$54,569,000**
Available Project Yield (acft/yr)	40,620
Annual Cost of Water ($ per acft), based on PF=1	$1,343
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$97
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.12
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.30

Note: One or more cost element has been calculated externally

Kiera Brown *5/2/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Aquifer Storage and Recovery (Pilot and Full Scale)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$28,037,000
Transmission Pipeline (0 in dia., miles)	$175,263,000
Well Fields (Wells, Pumps, and Piping)	$40,280,000
Integration, Relocations, & Other	$4,770,000
TOTAL COST OF FACILITIES	**$248,350,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$78,159,000
Environmental & Archaeology Studies and Mitigation	$24,358,000
Land Acquisition and Surveying (8 acres)	$9,743,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$9,917,000
TOTAL COST OF PROJECT	**$370,527,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$26,071,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$2,203,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$701,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$4,125,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (24444420 kW-hr @ 0.09 $/kW-hr)	$2,200,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$35,300,000**
Available Project Yield (acft/yr)	15,800
Annual Cost of Water ($ per acft), based on PF=1	$2,234
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$584
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.86
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.79

Note: One or more cost element has been calculated externally

Kiera Brown *7/3/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Off-Channel Reservoir with Evaporation Suppression

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Off-Channel Storage/Ring Dike (Conservation Pool acft, acres)	$213,000,000
Integration, Relocations, & Other	$13,171,000
TOTAL COST OF FACILITIES	**$226,171,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$79,160,000
Environmental & Archaeology Studies and Mitigation	$11,308,000
Land Acquisition and Surveying (10 acres)	$9,046,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$8,957,000
TOTAL COST OF PROJECT	**$334,642,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,103,000
Reservoir Debt Service (3.5 percent, 40 years)	$14,271,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$132,000
Intakes and Pump Stations (0% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$3,195,000
Water Treatment Plant	$5,406,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (3746721 kW-hr @ 0.09 $/kW-hr)	$337,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$25,444,000**
Available Project Yield (acft/yr)	25,000
Annual Cost of Water ($ per acft), based on PF=1	$1,018
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$363
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.12
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.11

Note: One or more cost element has been calculated externally

Kiera Brown *5/2/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Brackish Groundwater Desalination

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$4,152,000
Transmission Pipeline (0 in dia., miles)	$41,881,000
Transmission Pump Station(s) & Storage Tank(s)	$5,402,000
Well Fields (Wells, Pumps, and Piping)	$16,129,000
Water Treatment Plant (4.5 MGD)	$18,983,000
TOTAL COST OF FACILITIES	**$86,547,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$68,374,000
Environmental & Archaeology Studies and Mitigation	$4,913,000
Land Acquisition and Surveying (19 acres)	$4,442,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$3,413,000
TOTAL COST OF PROJECT	**$167,689,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$8,972,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$593,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$208,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$4,955,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (3101242 kW-hr @ 0.08 $/kW-hr)	$248,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$14,976,000**
Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=2	$2,995
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,201
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$9.19
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.68

Note: One or more cost element has been calculated externally

Erin Hynes *10/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Centralized Direct Non-Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station	$21,275,000
Transmission Pipeline	$148,561,000
Storage Tanks (Other Than at Booster Pump Stations)	$19,632,000
Water Treatment Plant	$21,463,000
TOTAL COST OF FACILITIES	**$210,931,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$66,398,000
Environmental & Archaeology Studies and Mitigation	$994,000
Land Acquisition and Surveying (7 acres)	$52,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$7,656,000
TOTAL COST OF PROJECT	**$286,031,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$20,125,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,682,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$532,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$1,614,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (11399708 kW-hr @ 0.08 $/kW-hr)	$912,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$24,865,000**
Available Project Yield (acft/yr)	25,000
Annual Cost of Water ($ per acft), based on PF=1	$995
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$190
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.05
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.58

Note: One or more cost element has been calculated externally

JB *11/4/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Decentralized Non-Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Storage Tanks (Other Than at Booster Pump Stations)	$247,000
Treatment Facilities	$3,942,000
TOTAL COST OF FACILITIES	**$4,189,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (35% for pipes & 35% for all other facilities)	$1,466,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$156,000
TOTAL COST OF PROJECT	**$5,811,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$409,000
Operation and Maintenance	
Intakes and Pump Stations (0% of Cost of Facilities)	$0
Dam and Reservoir (0% of Cost of Facilities)	$0
Water Treatment Plant	$394,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.09 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$803,000**
Available Project Yield (acft/yr)	16,680
Annual Cost of Water ($ per acft), based on PF=1	$48
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$24
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.07

Note: One or more cost element has been calculated externally

JB *11/8/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Austin Capture Local Inflows to Lady Bird Lake

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$879,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (151894 kW-hr @ 0.08 $/kW-hr)	$12,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$891,000**
Available Project Yield (acft/yr)	3,000
Annual Cost of Water ($ per acft), based on PF=1	$297
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$297
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.91
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.91

K. Brown *10/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Indirect Potable Reuse through Lady Bird Lake

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Intake Pump Stations (0 MGD)	$13,909,000
Transmission Pipeline (0 in dia., miles)*	$356,000
Advanced Water Treamtent Facility (MGD)	$2,030,000
Integration, Relocations, & Other	$7,114,000
TOTAL COST OF FACILITIES	**$23,409,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (35% for pipes & 35% for all other facilities)	$8,193,000
Environmental & Archaeology Studies and Mitigation	$2,341,000
Land Acquisition and Surveying (16 acres)	$936,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$960,000
TOTAL COST OF PROJECT	**$35,839,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,522,000
Operation and Maintenance	
Intakes and Pump Stations (5% of Cost of Facilities)	$686,000
Dam and Reservoir (3% of Cost of Facilities)	$0
Water Treatment Plant	$5,858,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1012587 kW-hr @ 0.08 $/kW-hr)	$81,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$9,147,000**
Available Project Yield (acft/yr)	20,000
Annual Cost of Water ($ per acft), based on PF=1	$457
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$331
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.40
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.02

Note: One or more cost element has been calculated externally

Kiera Brown *4/29/2019*

* Costs for the majority of pipeline components for this project are included in the Centralized Direct Non-Potable Reuse WMS.

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Austin - Longhorn Dam Operations Improvements

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$10,965,000
TOTAL COST OF FACILITIES	**$10,965,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,838,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$408,000
TOTAL COST OF PROJECT	**$15,211,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,070,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$110,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,180,000**
Available Project Yield (acft/yr)	3,000
Annual Cost of Water ($ per acft), based on PF=1	$393
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$37
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.21
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.11

Note: One or more cost element has been calculated externally

JB *1/7/2020*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Aqua WSC - Carrizo-Wilcox Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (1.4 MGD)	$1,860,000
Transmission Pipeline (10 in dia., miles)	$419,000
Well Fields (Wells, Pumps, and Piping)	$4,181,000
TOTAL COST OF FACILITIES	**$6,460,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,240,000
Environmental & Archaeology Studies and Mitigation	$161,000
Land Acquisition and Surveying (18 acres)	$56,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$246,000
TOTAL COST OF PROJECT	**$9,163,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$645,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$46,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$46,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (692497 kW-hr @ 0.08 $/kW-hr)	$55,000
Purchase of Water (800 acft/yr @ 11.4 $/acft)	$9,000
TOTAL ANNUAL COST	**$801,000**
Available Project Yield (acft/yr)	800
Annual Cost of Water ($ per acft), based on PF=2	$1,001
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$195
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.07
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.60

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Elgin - Carrizo-Wilcox Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (38798 kW-hr @ 0.08 $/kW-hr)	$3,000
Purchase of Water (50 acft/yr @ 11.4 $/acft)	$1,000
TOTAL ANNUAL COST	**$4,000**
Available Project Yield (acft/yr)	50
Annual Cost of Water ($ per acft), based on PF=2	$80
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$80
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.25
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.25

Kiera Brown *8/27/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Pflugerville - Edwards BFZ Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (14773 kW-hr @ 0.08 $/kW-hr)	$1,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,000**
Available Project Yield (acft/yr)	20
Annual Cost of Water ($ per acft), based on PF=1	$50
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$50
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.15

Kiera Brown *8/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Sunset Valley - Edwards-BFZ Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (36932 kW-hr @ 0.08 $/kW-hr)	$3,000
Purchase of Water (50 acft/yr @ 55.39 $/acft)	$3,000
TOTAL ANNUAL COST	**$6,000**
Available Project Yield (acft/yr)	50
Annual Cost of Water ($ per acft), based on PF=1	$120
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$120
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.37
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.37

Kiera Brown *8/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Johnson City - Ellenburger-San-Saba Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (85644 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$7,000**
Available Project Yield (acft/yr)	100
Annual Cost of Water ($ per acft), based on PF=2	$70
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$70
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.21
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.21

Kiera Brown, Erin Hynes - 2/4 *2/4/2020*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Bertram - Ellenburger-San Saba Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$4,406,000
Transmission Pipeline (0 in dia., miles)	$724,000
Well Fields (Wells, Pumps, and Piping)	$405,000
Water Treatment Plant (1.8 MGD)	$9,391,000
TOTAL COST OF FACILITIES	**$14,926,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$5,188,000
Environmental & Archaeology Studies and Mitigation	$94,000
Land Acquisition and Surveying (9 acres)	$63,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$558,000
TOTAL COST OF PROJECT	**$20,829,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,465,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$11,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$110,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$828,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (703636 kW-hr @ 0.08 $/kW-hr)	$56,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,470,000**
Available Project Yield (acft/yr)	2,000
Annual Cost of Water ($ per acft), based on PF=1	$1,235
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$503
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.79
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.54

Kiera Brown	*10/3/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Burnet County, Colorado Basin) - Ellenburger-San Saba Aquifer - Expand Local Use of GW

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$4,782,000
TOTAL COST OF FACILITIES	**$4,782,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,674,000
Environmental & Archaeology Studies and Mitigation	$326,000
Land Acquisition and Surveying (17 acres)	$125,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$190,000
TOTAL COST OF PROJECT	**$7,097,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$499,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$48,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (426852 kW-hr @ 0.08 $/kW-hr)	$34,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$581,000**
Available Project Yield (acft/yr)	1,000
Annual Cost of Water ($ per acft), based on PF=1	$581
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$82
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.78
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.25

Kiera Brown *10/3/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Colorado Co., Bra-Col Basin) - Gulf Coast Aquifer - Expand Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$3,069,000
TOTAL COST OF FACILITIES	**$3,069,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,074,000
Environmental & Archaeology Studies and Mitigation	$163,000
Land Acquisition and Surveying (8 acres)	$56,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$120,000
TOTAL COST OF PROJECT	**$4,482,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$315,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$31,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1200910 kW-hr @ 0.08 $/kW-hr)	$96,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$442,000**
Available Project Yield (acft/yr)	2,500
Annual Cost of Water ($ per acft), based on PF=1	$177
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$51
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.54
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.16
Kiera Brown	*8/1/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Corix Utilities Texas Inc. - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2478 kW-hr @ 0.08 $/kW-hr)	$198
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$0**
Available Project Yield (acft/yr)	4
Annual Cost of Water ($ per acft), based on PF=1	$50
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$50
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.15

Kiera Brown *7/31/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
County-Other (Colorado Co.) - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$1,406,000
TOTAL COST OF FACILITIES	**$1,406,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$492,000
Environmental & Archaeology Studies and Mitigation	$44,000
Land Acquisition and Surveying (1 acres)	$7,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$54,000
TOTAL COST OF PROJECT	**$2,003,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$141,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$14,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (82697 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$162,000**
Available Project Yield (acft/yr)	133
Annual Cost of Water ($ per acft), based on PF=1	$1,218
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$158
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.74
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.48

Kiera Brown *7/29/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Colorado Co., Col Basin) - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$972,000
TOTAL COST OF FACILITIES	**$972,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$340,000
Environmental & Archaeology Studies and Mitigation	$54,000
Land Acquisition and Surveying (3 acres)	$19,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$39,000
TOTAL COST OF PROJECT	**$1,424,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$100,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$10,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (341978 kW-hr @ 0.08 $/kW-hr)	$27,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$137,000**
Available Project Yield (acft/yr)	550
Annual Cost of Water ($ per acft), based on PF=1	$249
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$67
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.76
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.21

Kiera Brown *7/31/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Colorado Co., Lav Basin) - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$6,019,000
TOTAL COST OF FACILITIES	**$6,019,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,107,000
Environmental & Archaeology Studies and Mitigation	$308,000
Land Acquisition and Surveying (16 acres)	$105,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$235,000
TOTAL COST OF PROJECT	**$8,774,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$617,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$60,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2205242 kW-hr @ 0.08 $/kW-hr)	$176,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$853,000**
Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=1	$171
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$47
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.52
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.14

Kiera Brown *8/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
County-Other (Fayette Co.) - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (25493 kW-hr @ 0.08 $/kW-hr)	$2,000
Purchase of Water (41 acft/yr @ 1 $/acft)	$0
TOTAL ANNUAL COST	**$2,000**
Available Project Yield (acft/yr)	41
Annual Cost of Water ($ per acft), based on PF=1	$49
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$49
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.15

Kiera Brown *10/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Bay City - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (47401 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$4,000**
Available Project Yield (acft/yr)	75
Annual Cost of Water ($ per acft), based on PF=1	$53
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$53
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.16
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.16

Kiera Brown *7/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Matagorda Co., Col-Lav Basin) - Gulf Coast Aquifer - Expand Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Well Fields (Wells, Pumps, and Piping)	$985,000
TOTAL COST OF FACILITIES	**$985,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$345,000
Environmental & Archaeology Studies and Mitigation	$49,000
Land Acquisition and Surveying (3 acres)	$13,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$39,000
TOTAL COST OF PROJECT	**$1,431,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$101,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$10,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (225294 kW-hr @ 0.08 $/kW-hr)	$18,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$129,000**
Available Project Yield (acft/yr)	300
Annual Cost of Water ($ per acft), based on PF=1	$430
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$93
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.32
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.29

Kiera Brown *8/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Wharton, Brazos-Colorado) - Expand Local Use of Groundwater - Gulf Coast

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$5,676,000
TOTAL COST OF FACILITIES	**$5,676,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,987,000
Environmental & Archaeology Studies and Mitigation	$327,000
Land Acquisition and Surveying (17 acres)	$112,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$223,000
TOTAL COST OF PROJECT	**$8,325,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$586,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$57,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2600266 kW-hr @ 0.08 $/kW-hr)	$208,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$851,000**
Available Project Yield (acft/yr)	5,000
Annual Cost of Water ($ per acft), based on PF=1	$170
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$53
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.52
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.16

Kiera Brown *8/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Wharton - Gulf Coast Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0 MGD)	$1,191,000
Well Fields (Wells, Pumps, and Piping)	$5,163,000
TOTAL COST OF FACILITIES	**$6,354,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,224,000
Environmental & Archaeology Studies and Mitigation	$207,000
Land Acquisition and Surveying (16 acres)	$71,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$244,000
TOTAL COST OF PROJECT	**$9,100,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$640,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$52,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$30,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1181564 kW-hr @ 0.08 $/kW-hr)	$95,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$817,000**
Available Project Yield (acft/yr)	3,000
Annual Cost of Water ($ per acft), based on PF=2	$272
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$59
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.84
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.18

Kiera Brown *7/29/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Wharton Co., Colorado Basin) - Gulf Coast Aquifer - Expand Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$878,000
TOTAL COST OF FACILITIES	**$878,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$307,000
Environmental & Archaeology Studies and Mitigation	$54,000
Land Acquisition and Surveying (3 acres)	$19,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$35,000
TOTAL COST OF PROJECT	**$1,293,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$91,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (314539 kW-hr @ 0.08 $/kW-hr)	$25,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$125,000**
Available Project Yield (acft/yr)	600
Annual Cost of Water ($ per acft), based on PF=1	$208
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$57
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.64
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.17

Kiera Brown *7/31/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Fayette County Other (Colorado Basin) - Sparta Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$858,000
Transmission Pipeline (0 in dia., miles)	$134,000
Well Fields (Wells, Pumps, and Piping)	$682,000
TOTAL COST OF FACILITIES	**$1,674,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$579,000
Environmental & Archaeology Studies and Mitigation	$182,000
Land Acquisition and Surveying (9 acres)	$132,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$71,000
TOTAL COST OF PROJECT	**$2,638,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$186,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$8,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$21,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (188610 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (204 acft/yr @ 1 $/acft)	$0
TOTAL ANNUAL COST	**$230,000**
Available Project Yield (acft/yr)	204
Annual Cost of Water ($ per acft), based on PF=2	$1,127
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$216
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.46
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.66

Note: One or more cost element has been calculated externally

Kiera Brown *8/5/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Hays County Other (Colorado Basin) - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$856,000
Transmission Pipeline (0 in dia., miles)	$134,000
Well Fields (Wells, Pumps, and Piping)	$813,000
TOTAL COST OF FACILITIES	**$1,803,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$624,000
Environmental & Archaeology Studies and Mitigation	$112,000
Land Acquisition and Surveying (9 acres)	$63,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$72,000
TOTAL COST OF PROJECT	**$2,674,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$188,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$21,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (223184 kW-hr @ 0.08 $/kW-hr)	$18,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$236,000**
Available Project Yield (acft/yr)	200
Annual Cost of Water ($ per acft), based on PF=2	$1,180
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$240
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.62
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.74

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Dripping Springs WSC - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$871,000
Transmission Pipeline (0 in dia., miles)	$210,000
Well Fields (Wells, Pumps, and Piping)	$1,290,000
TOTAL COST OF FACILITIES	**$2,371,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$819,000
Environmental & Archaeology Studies and Mitigation	$148,000
Land Acquisition and Surveying (11 acres)	$75,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$94,000
TOTAL COST OF PROJECT	**$3,507,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$247,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$15,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$22,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (289973 kW-hr @ 0.08 $/kW-hr)	$23,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$307,000**
Available Project Yield (acft/yr)	300
Annual Cost of Water ($ per acft), based on PF=2	$1,023
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$200
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.14
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.61

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Hays County, Colorado Basin) - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$1,625,000
TOTAL COST OF FACILITIES	**$1,625,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$569,000
Environmental & Archaeology Studies and Mitigation	$111,000
Land Acquisition and Surveying (6 acres)	$39,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$65,000
TOTAL COST OF PROJECT	**$2,409,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$169,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$16,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (489727 kW-hr @ 0.08 $/kW-hr)	$39,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$224,000**
Available Project Yield (acft/yr)	600
Annual Cost of Water ($ per acft), based on PF=1	$373
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$92
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.28

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Mills County, Brazos Basin) - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$883,000
TOTAL COST OF FACILITIES	**$883,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$309,000
Environmental & Archaeology Studies and Mitigation	$78,000
Land Acquisition and Surveying (5 acres)	$17,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$36,000
TOTAL COST OF PROJECT	**$1,323,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$93,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (243564 kW-hr @ 0.08 $/kW-hr)	$19,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$121,000**
Available Project Yield (acft/yr)	300
Annual Cost of Water ($ per acft), based on PF=1	$403
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$93
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.24
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.29

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Garfield WSC - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
ANNUAL COST	
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (44865 kW-hr @ 0.08 $/kW-hr)	$4,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$4,000**
Available Project Yield (acft/yr)	47
Annual Cost of Water ($ per acft), based on PF=1	$85
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$85
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.26
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.26

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Manville WSC - Trinity Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$957,000
Transmission Pipeline (0 in dia., miles)	$285,000
Well Fields (Wells, Pumps, and Piping)	$2,178,000
TOTAL COST OF FACILITIES	**$3,420,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,183,000
Environmental & Archaeology Studies and Mitigation	$203,000
Land Acquisition and Surveying (14 acres)	$94,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$135,000
TOTAL COST OF PROJECT	**$5,035,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$354,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$25,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (606720 kW-hr @ 0.08 $/kW-hr)	$49,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$452,000**
Available Project Yield (acft/yr)	703
Annual Cost of Water ($ per acft), based on PF=2	$643
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$139
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$1.97
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.43

Kiera Brown *8/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Fayette County, Colorado Basin) - Yegua-Jackson Aquifer - Expand Local Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$2,127,000
TOTAL COST OF FACILITIES	**$2,127,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$745,000
Environmental & Archaeology Studies and Mitigation	$163,000
Land Acquisition and Surveying (380 acres)	$2,281,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$147,000
TOTAL COST OF PROJECT	**$5,463,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$384,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$21,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (315077 kW-hr @ 0.08 $/kW-hr)	$25,000
Purchase of Water (760 acft/yr @ 1 $/acft)	$1,000
TOTAL ANNUAL COST	**$431,000**
Available Project Yield (acft/yr)	760
Annual Cost of Water ($ per acft), based on PF=1	$567
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$62
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.74
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.19

Note: One or more cost element has been calculated externally

Kiera Brown *8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Burnet County, Brazos Basin) - Ellenburger-San Saba Aquifer - Develop New GW

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$3,119,000
TOTAL COST OF FACILITIES	**$3,119,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,092,000
Environmental & Archaeology Studies and Mitigation	$163,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$121,000
TOTAL COST OF PROJECT	**$4,495,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$316,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$31,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (339481 kW-hr @ 0.08 $/kW-hr)	$27,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$374,000**
Available Project Yield (acft/yr)	700
Annual Cost of Water ($ per acft), based on PF=1	$534
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$83
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.64
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.25

Kiera Brown *8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Irrigation (Matagorda County, Col Basin) - Gulf Coast Aquifer - Development of New GW

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Well Fields (Wells, Pumps, and Piping)	$843,000
TOTAL COST OF FACILITIES	**$843,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$295,000
Environmental & Archaeology Studies and Mitigation	$25,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$32,000
TOTAL COST OF PROJECT	**$1,195,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$84,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$8,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$92,000**
Available Project Yield (acft/yr)	510
Annual Cost of Water ($ per acft), based on PF=1	$180
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$16
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.55
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.05

Kiera Brown *8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Burnet County, Colorado Basin) - Hickory Aquifer - Development of New Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Well Fields (Wells, Pumps, and Piping)	$3,431,000
TOTAL COST OF FACILITIES	**$3,431,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,201,000
Environmental & Archaeology Studies and Mitigation	$100,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$131,000
TOTAL COST OF PROJECT	**$4,863,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$342,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$34,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (699141 kW-hr @ 0.08 $/kW-hr)	$56,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$432,000**
Available Project Yield (acft/yr)	1,000
Annual Cost of Water ($ per acft), based on PF=1	$432
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$90
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.33
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.28
Kiera Brown	*8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Mining (Burnet County, Colorado Basin) - Marble Falls Aquifer - Development of New GW

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Well Fields (Wells, Pumps, and Piping)	$2,346,000
TOTAL COST OF FACILITIES	**$2,346,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$821,000
Environmental & Archaeology Studies and Mitigation	$88,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$90,000
TOTAL COST OF PROJECT	**$3,345,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$235,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$23,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (609846 kW-hr @ 0.08 $/kW-hr)	$49,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$307,000**
Available Project Yield (acft/yr)	1,000
Annual Cost of Water ($ per acft), based on PF=1	$307
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$72
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.94
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.22

Kiera Brown *8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Fayette County-Other (Lavaca from Colorado Basin) - Sparta - Development of New GW

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$933,000
Transmission Pipeline (0 in dia., miles)	$671,000
Well Fields (Wells, Pumps, and Piping)	$1,094,000
Water Treatment Plant (0.4 MGD)	$537,000
TOTAL COST OF FACILITIES	**$3,266,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,110,000
Environmental & Archaeology Studies and Mitigation	$307,000
Land Acquisition and Surveying (18 acres)	$1,210,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$163,000
TOTAL COST OF PROJECT	**$6,056,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$426,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$18,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$23,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$177,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (407348 kW-hr @ 0.08 $/kW-hr)	$33,000
Purchase of Water (400 acft/yr @ 1 $/acft)	$0
TOTAL ANNUAL COST	**$677,000**
Available Project Yield (acft/yr)	400
Annual Cost of Water ($ per acft), based on PF=1	$1,693
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$628
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.19
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.93

Note: One or more cost element has been calculated externally

Kiera Brown *10/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Hays - Trinity Aquifer - Development of New Groundwater Supplies

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$818,000
Transmission Pipeline (0 in dia., miles)	$671,000
Well Fields (Wells, Pumps, and Piping)	$745,000
Water Treatment Plant (0.1 MGD)	$258,000
TOTAL COST OF FACILITIES	**$2,492,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$839,000
Environmental & Archaeology Studies and Mitigation	$196,000
Land Acquisition and Surveying (13 acres)	$92,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$100,000
TOTAL COST OF PROJECT	**$3,719,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$262,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$14,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$85,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (21055 kW-hr @ 0.08 $/kW-hr)	$2,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$383,000**
Available Project Yield (acft/yr)	100
Annual Cost of Water ($ per acft), based on PF=2	$3,830
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,210
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$11.75
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.71

Kiera Brown *8/7/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Elgin - Trinity Aquifer - Development of New Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$1,594,000
Transmission Pipeline (0 in dia., miles)	$2,180,000
Well Fields (Wells, Pumps, and Piping)	$4,955,000
Storage Tanks (Other Than at Booster Pump Stations)	$82,000
Water Treatment Plant (1.6 MGD)	$1,414,000
TOTAL COST OF FACILITIES	**$10,225,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,470,000
Environmental & Archaeology Studies and Mitigation	$482,000
Land Acquisition and Surveying (30 acres)	$201,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$396,000
TOTAL COST OF PROJECT	**$14,774,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,039,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$72,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$40,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$467,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1519662 kW-hr @ 0.08 $/kW-hr)	$122,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,740,000**
Available Project Yield (acft/yr)	1,825
Annual Cost of Water ($ per acft), based on PF=2	$953
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$384
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$2.93
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.18

Note: One or more cost element has been calculated externally

Kiera Brown *8/15/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Sunset Valley - Trinity Aquifer - Development of New Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$930,000
Transmission Pipeline (0 in dia., miles)	$1,048,000
Well Fields (Wells, Pumps, and Piping)	$1,185,000
Storage Tanks (Other Than at Booster Pump Stations)	$50,000
Water Treatment Plant (0.3 MGD)	$451,000
TOTAL COST OF FACILITIES	**$3,664,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,230,000
Environmental & Archaeology Studies and Mitigation	$244,000
Land Acquisition and Surveying (17 acres)	$118,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$145,000
TOTAL COST OF PROJECT	**$5,401,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$380,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$23,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$23,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$149,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (333459 kW-hr @ 0.08 $/kW-hr)	$27,000
Purchase of Water (300 acft/yr @ 55.39 $/acft)	$17,000
TOTAL ANNUAL COST	**$619,000**
Available Project Yield (acft/yr)	300
Annual Cost of Water ($ per acft), based on PF=2	$2,063
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$797
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.33
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.44

Note: One or more cost element has been calculated externally

Kiera Brown *7/24/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Travis County MUD 10 - Trinity Aquifer - Development of New Groundwater Supplies

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$818,000
Transmission Pipeline (0 in dia., miles)	$671,000
Well Fields (Wells, Pumps, and Piping)	$745,000
Water Treatment Plant (0.1 MGD)	$258,000
TOTAL COST OF FACILITIES	**$2,492,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$839,000
Environmental & Archaeology Studies and Mitigation	$196,000
Land Acquisition and Surveying (13 acres)	$92,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$100,000
TOTAL COST OF PROJECT	**$3,719,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$262,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$14,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$85,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (21055 kW-hr @ 0.08 $/kW-hr)	$2,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$383,000**
Available Project Yield (acft/yr)	100
Annual Cost of Water ($ per acft), based on PF=2	$3,830
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,210
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$11.75
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.71
Kiera Brown	*9/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Manufacturing (Fayette County, Lavaca Basin) - Yegua-Jackson Aquifer - Develop New GW

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$444,000
Transmission Pipeline (0 in dia., miles)	$671,000
Well Fields (Wells, Pumps, and Piping)	$803,000
TOTAL COST OF FACILITIES	**$2,178,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$728,000
Environmental & Archaeology Studies and Mitigation	$514,000
Land Acquisition and Surveying (70 acres)	$436,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$107,000
TOTAL COST OF PROJECT	**$3,963,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$279,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$15,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$11,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$86,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (68735 kW-hr @ 0.08 $/kW-hr)	$5,000
Purchase of Water (100 acft/yr @ 1 $/acft)	$0
TOTAL ANNUAL COST	**$396,000**
Available Project Yield (acft/yr)	100
Annual Cost of Water ($ per acft), based on PF=1	$3,960
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,170
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$12.15
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.59

Note: One or more cost element has been calculated externally

Kiera Brown *10/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Smithville - Yegua-Jackson Aquifer - Develop New GW

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$961,000
Transmission Pipeline (0 in dia., miles)	$1,048,000
Transmission Pump Station(s) & Storage Tank(s)	$0
Well Fields (Wells, Pumps, and Piping)	$3,251,000
Water Treatment Plant (0.6 MGD)	$796,000
TOTAL COST OF FACILITIES	**$6,056,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,067,000
Environmental & Archaeology Studies and Mitigation	$2,498,000
Land Acquisition and Surveying (387 acres)	$2,440,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$360,000
TOTAL COST OF PROJECT	**$13,421,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$944,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$43,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$263,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (511065 kW-hr @ 0.08 $/kW-hr)	$41,000
Purchase of Water (700 acft/yr @ 9.15 $/acft)	$6,000
TOTAL ANNUAL COST	**$1,321,000**
Available Project Yield (acft/yr)	700
Annual Cost of Water ($ per acft), based on PF=1	$1,887
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$539
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$5.79
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.65

Note: One or more cost element has been calculated externally

Kiera Brown *10/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
WTCPUA, County-Other (Hays) - Groundwater Importation - Hays Co.. Pipeline

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Transmission Pipeline (0 in dia., miles)	$22,050,000
TOTAL COST OF FACILITIES	**$22,050,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$6,615,000
Environmental & Archaeology Studies and Mitigation	$475,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$802,000
TOTAL COST OF PROJECT	**$29,942,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,107,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$220,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2241062 kW-hr @ 0.08 $/kW-hr)	$179,000
Purchase of Water (4000 acft/yr @ 1492 $/acft)	$5,968,000
TOTAL ANNUAL COST	**$8,474,000**
Available Project Yield (acft/yr)	4,000
Annual Cost of Water ($ per acft), based on PF=1.3	$2,119
Annual Cost of Water After Debt Service ($ per acft), based on PF=1.3	$1,592
Annual Cost of Water ($ per 1,000 gallons), based on PF=1.3	$6.50
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1.3	$4.88

Note: One or more cost element has been calculated externally

JB *1/28/2020*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Buda - BS/EACD Edwards/Middle Trinity ASR

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$958,000
Transmission Pipeline (0 in dia., miles)	$404,000
Well Fields (Wells, Pumps, and Piping)	$3,169,000
Water Treatment Plant (0.5 MGD)	$704,000
TOTAL COST OF FACILITIES	**$5,235,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,812,000
Environmental & Archaeology Studies and Mitigation	$88,000
Land Acquisition and Surveying (9 acres)	$17,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$197,000
TOTAL COST OF PROJECT	**$7,349,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$517,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$36,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$232,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (374537 kW-hr @ 0.08 $/kW-hr)	$30,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$839,000**
Available Project Yield (acft/yr)	600
Annual Cost of Water ($ per acft), based on PF=2	$1,398
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$537
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.29
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$1.65

Kiera Brown *11/8/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Hays - BS/EACD Edwards/Middle Trinity ASR

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$845,000
Transmission Pipeline (0 in dia., miles)	$186,000
Well Fields (Wells, Pumps, and Piping)	$2,677,000
Water Treatment Plant (0.1 MGD)	$318,000
TOTAL COST OF FACILITIES	**$4,026,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,400,000
Environmental & Archaeology Studies and Mitigation	$76,000
Land Acquisition and Surveying (9 acres)	$19,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$152,000
TOTAL COST OF PROJECT	**$5,673,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$399,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$29,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$21,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$105,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (89819 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$561,000**
Available Project Yield (acft/yr)	146
Annual Cost of Water ($ per acft), based on PF=2	$3,842
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,110
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$11.79
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.40

Kiera Brown *10/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Hays County-Other - BS/EACD Edwards/Middle Trinity ASR

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0 MGD)	$931,000
Transmission Pipeline (0 in dia., miles)	$186,000
Well Fields (Wells, Pumps, and Piping)	$2,677,000
Water Treatment Plant (0.3 MGD)	$441,000
TOTAL COST OF FACILITIES	**$4,235,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,473,000
Environmental & Archaeology Studies and Mitigation	$77,000
Land Acquisition and Surveying (9 acres)	$20,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$160,000
TOTAL COST OF PROJECT	**$5,965,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$420,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$29,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$23,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$146,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (183547 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$633,000**
Available Project Yield (acft/yr)	289
Annual Cost of Water ($ per acft), based on PF=2	$2,190
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$737
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.72
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.26

Kiera Brown *10/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Creedmoor-Maha WSC - BS/EACD Edwards/Middle Trinity ASR

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$931,000
Transmission Pipeline (0 in dia., miles)	$186,000
Well Fields (Wells, Pumps, and Piping)	$2,677,000
Water Treatment Plant (0.3 MGD)	$441,000
TOTAL COST OF FACILITIES	**$4,235,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,473,000
Environmental & Archaeology Studies and Mitigation	$82,000
Land Acquisition and Surveying (9 acres)	$25,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$160,000
TOTAL COST OF PROJECT	**$5,975,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$420,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$29,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$23,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$146,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (183547 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$633,000**
Available Project Yield (acft/yr)	289
Annual Cost of Water ($ per acft), based on PF=2	$2,190
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$737
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.72
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.26

Kiera Brown *10/28/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Buda and Hays County-Other - BSEACD Desalination and ASR - Saline Edwards

Cost based on ENR CCI 11170.28 for September 2018 and
a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (2.3 MGD)	$1,960,000
Transmission Pipeline (12 in dia., miles)	$1,340,000
Well Fields (Wells, Pumps, and Piping)	$3,410,000
Two Water Treatment Plants (0.9 MGD and 0.3 MGD)	$5,067,000
TOTAL COST OF FACILITIES	**$11,777,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$4,055,000
Environmental & Archaeology Studies and Mitigation	$261,000
Land Acquisition and Surveying (18 acres)	$125,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$446,000
TOTAL COST OF PROJECT	**$16,664,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,172,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$47,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$49,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$1,128,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1318756 kW-hr @ 0.08 $/kW-hr)	$106,000
Purchase of Water (1300 acft/yr @ 26.07 $/acft)	$34,000
TOTAL ANNUAL COST	**$2,536,000**
Available Project Yield (acft/yr)	1,300
Annual Cost of Water ($ per acft), based on PF=2	$1,951
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,049
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$5.99
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.22

KB *10/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Vista Regional Project

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$1,146,000
Transmission Pipeline (0 in dia., miles)	$291,000
Water Treatment Plant (8.7 MGD)	$19,082,000
TOTAL COST OF FACILITIES	**$20,519,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$7,167,000
Environmental & Archaeology Studies and Mitigation	$359,000
Land Acquisition and Surveying (9 acres)	$67,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$774,000
TOTAL COST OF PROJECT	**$28,886,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,032,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$3,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$29,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,631,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (1786188 kW-hr @ 0.08 $/kW-hr)	$143,000
Purchase of Water (4884 acft/yr @ 145 $/acft)	$708,000
TOTAL ANNUAL COST	**$5,546,000**
Available Project Yield (acft/yr)	4,884
Annual Cost of Water ($ per acft), based on PF=2	$1,136
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$719
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$3.48
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.21

Note: One or more cost element has been calculated externally

Jaime Burke *4/16/2019*

Cost Estimate Summary *Water Supply Project Option* *September 2018 Prices* *Burnet County-Other - East Lake Buchanan Project*	
Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018	
Item	***Estimated Costs for Facilities***
Intake Pump Stations (1.7 MGD)	$390,000
Transmission Pipeline (10 in dia., miles)	$627,000
Water Treatment Plant (1.7 MGD)	$7,289,000
TOTAL COST OF FACILITIES	**$8,306,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,876,000
Environmental & Archaeology Studies and Mitigation	$361,000
Land Acquisition and Surveying (11 acres)	$62,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$320,000
TOTAL COST OF PROJECT	**$11,925,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$839,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$6,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$10,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$806,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (407953 kW-hr @ 0.08 $/kW-hr)	$33,000
Purchase of Water (935 acft/yr @ 145 $/acft)	$136,000
TOTAL ANNUAL COST	**$1,830,000**
Available Project Yield (acft/yr)	935
Annual Cost of Water ($ per acft), based on PF=2	$1,957
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,060
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$6.01
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$3.25
Note: One or more cost element has been calculated externally	
Erin Hynes	*4/16/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
County Other - Burnet - Colorado, Marble Falls - Burnet - Colorado - Marble Falls RWS

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Intake Pump Stations (6.5 MGD)	$2,329,000
Transmission Pipeline (18 in dia., miles)	$2,131,000
Water Treatment Plant (10 MGD)	$35,932,000
TOTAL COST OF FACILITIES	**$40,392,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$14,030,000
Environmental & Archaeology Studies and Mitigation	$570,000
Land Acquisition and Surveying (15 acres)	$100,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,516,000
TOTAL COST OF PROJECT	**$56,608,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,983,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$21,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$58,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$2,970,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (2110663 kW-hr @ 0.08 $/kW-hr)	$169,000
Purchase of Water (5578 acft/yr @ 145 $/acft)	$809,000
TOTAL ANNUAL COST	**$8,010,000**
Available Project Yield (acft/yr)	5,578
Annual Cost of Water ($ per acft), based on PF=2	$1,436
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$722
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.41
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$2.22

Note: One or more cost element has been calculated externally

Erin Hynes *4/17/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Hays - Water Purchase needing Infrastructure

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Transmission Pipeline (0 in dia., miles)	$134,000
TOTAL COST OF FACILITIES	**$134,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$40,000
Environmental & Archaeology Studies and Mitigation	$25,000
Land Acquisition and Surveying (6 acres)	$8,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$6,000
TOTAL COST OF PROJECT	**$213,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$15,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (18577 kW-hr @ 0.08 $/kW-hr)	$1,000
Purchase of Water (140 acft/yr @ 1411 $/acft)	$198,000
TOTAL ANNUAL COST	**$215,000**
Available Project Yield (acft/yr)	140
Annual Cost of Water ($ per acft), based on PF=2	$1,536
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$1,429
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$4.71
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$4.38

JB *10/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Brush Management

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Integration, Relocations, & Other	$28,911,000
TOTAL COST OF FACILITIES	**$28,911,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 0% for all other facilities)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$796,000
TOTAL COST OF PROJECT	**$29,707,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,090,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$289,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$2,379,000**
Available Project Yield (acft/yr)	2,000
Annual Cost of Water ($ per acft), based on PF=1	$1,190
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$145
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$3.65
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.44
Note: One or more cost element has been calculated externally	
JB/AS	*10/2/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Buda - Direct Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Advanced Water Treamtent Facility (2 MGD)	$24,148,000
TOTAL COST OF FACILITIES	**$24,148,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$8,452,000
Land Acquisition and Surveying (1 acres)	$6,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$897,000
TOTAL COST OF PROJECT	**$33,503,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,357,000
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$2,042,000
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$4,399,000**
Available Project Yield (acft/yr)	2,240
Annual Cost of Water ($ per acft), based on PF=1	$1,964
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$912
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$6.03
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.80
Note: One or more cost element has been calculated externally	
Kiera Brown	*9/24/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Dripping Springs - Direct Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Advanced Water Treamtent Facility (0.5 MGD)	$8,736,000
TOTAL COST OF FACILITIES	**$8,736,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$3,058,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$325,000
TOTAL COST OF PROJECT	**$12,119,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$853,000
Operation and Maintenance	
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$593,000
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,446,000**
Available Project Yield (acft/yr)	560
Annual Cost of Water ($ per acft), based on PF=1	$2,582
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,059
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$7.92
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.25

Kiera Brown *9/25/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Llano - Llano Direct Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$798,000
Transmission Pipeline (0 in dia., miles)	$134,000
Advanced Water Treamtent Facility (0.25 MGD)	$6,500,000
TOTAL COST OF FACILITIES	**$7,432,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,595,000
Environmental & Archaeology Studies and Mitigation	$70,000
Land Acquisition and Surveying (9 acres)	$39,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$279,000
TOTAL COST OF PROJECT	**$10,415,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$733,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$297,000
Pumping Energy Costs (39426 kW-hr @ 0.08 $/kW-hr)	$3,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$1,054,000**
Available Project Yield (acft/yr)	280
Annual Cost of Water ($ per acft), based on PF=1	$3,764
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,146
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$11.55
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.52

Note: One or more cost element has been calculated externally

Erin Hynes *1/28/2020*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
West Travis County PUA - Direct Potable Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0 MGD)	$870,000
Transmission Pipeline (0 in dia., miles)	$82,000
Transmission Pump Station(s) & Storage Tank(s)	$1,679,000
Advanced Water Treamtent Facility (0.3 MGD)	$2,975,000
TOTAL COST OF FACILITIES	**$5,606,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$1,958,000
Environmental & Archaeology Studies and Mitigation	$13,000
Land Acquisition and Surveying (5 acres)	$2,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$209,000
TOTAL COST OF PROJECT	**$7,788,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$548,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$9,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$44,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$356,000
Pumping Energy Costs (193185 kW-hr @ 0.08 $/kW-hr)	$15,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$972,000**
Available Project Yield (acft/yr)	336
Annual Cost of Water ($ per acft), based on PF=1	$2,893
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$1,262
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$8.88
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$3.87

Kiera Brown *9/25/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Blanco - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.1 MGD)	$739,000
Transmission Pipeline (8 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$31,000
TOTAL COST OF FACILITIES	**$770,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$270,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (16 acres)	$40,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$30,000
TOTAL COST OF PROJECT	**$1,110,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$78,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$18,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (88471 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$103,000**
Available Project Yield (acft/yr)	146
Annual Cost of Water ($ per acft), based on PF=1	$705
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$171
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.16
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.53

Note: One or more cost element has been calculated externally

Kiera Brown *10/6/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Horseshoe Bay - Direct Reuse - Horseshoe Bay

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.1 MGD)	$781,000
Transmission Pipeline (8 in dia., miles)	$0
TOTAL COST OF FACILITIES	**$781,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$273,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (14 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$30,000
TOTAL COST OF PROJECT	**$1,084,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$76,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$20,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (93541 kW-hr @ 0.08 $/kW-hr)	$7,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$103,000**
Available Project Yield (acft/yr)	154
Annual Cost of Water ($ per acft), based on PF=1	$669
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$175
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$2.05
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.54

Kiera Brown *9/11/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Marble Falls - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0.5 MGD)	$887,000
Transmission Pipeline (8 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$93,000
TOTAL COST OF FACILITIES	**$980,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$343,000
Environmental & Archaeology Studies and Mitigation	$13,000
Land Acquisition and Surveying (17 acres)	$14,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$38,000
TOTAL COST OF PROJECT	**$1,388,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$98,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$22,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (335267 kW-hr @ 0.08 $/kW-hr)	$27,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$148,000**
Available Project Yield (acft/yr)	500
Annual Cost of Water ($ per acft), based on PF=1	$296
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$100
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.91
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.31

Note: One or more cost element has been calculated externally

Kiera Brown *9/12/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Fredericksburg - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Integration, Relocations, & Other	$7,335,000
TOTAL COST OF FACILITIES	**$7,335,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$2,567,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$273,000
TOTAL COST OF PROJECT	**$10,175,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$716,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$73,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$789,000**
Available Project Yield (acft/yr)	132
Annual Cost of Water ($ per acft), based on PF=1	$5,977
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$553
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$18.34
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$1.70

Note: One or more cost element has been calculated externally

Kiera Brown *9/11/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Dripping Springs WSC - Dripping Springs - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.6 MGD)	$952,000
Transmission Pipeline (8 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$93,000
TOTAL COST OF FACILITIES	**$1,045,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$366,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (19 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$39,000
TOTAL COST OF PROJECT	**$1,450,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$102,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$24,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (530424 kW-hr @ 0.08 $/kW-hr)	$42,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$169,000**
Available Project Yield (acft/yr)	672
Annual Cost of Water ($ per acft), based on PF=1	$251
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$100
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.77
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.31

Note: One or more cost element has been calculated externally

Kiera Brown *9/12/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
West Travis County PUA - Direct Reuse - West Travis County PUA

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0.2 MGD)	$0
Transmission Pipeline (6 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$31,000
TOTAL COST OF FACILITIES	**$31,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$11,000
Environmental & Archaeology Studies and Mitigation	$76,000
Land Acquisition and Surveying (17 acres)	$83,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$6,000
TOTAL COST OF PROJECT	**$207,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$15,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$0
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (146007 kW-hr @ 0.08 $/kW-hr)	$12,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$27,000**
Available Project Yield (acft/yr)	224
Annual Cost of Water ($ per acft), based on PF=2	$121
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$54
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.37
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.16

Note: One or more cost element has been calculated externally

Kiera Brown *9/12/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Lago Vista - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0.6 MGD)	$0
Transmission Pipeline (8 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$93,000
Water Treatment Plant (0.6 MGD)	$60,000
TOTAL COST OF FACILITIES	**$153,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$53,000
Environmental & Archaeology Studies and Mitigation	$0
Land Acquisition and Surveying (20 acres)	$0
Interest During Construction (3% for 1 years with a 0.5% ROI)	$6,000
TOTAL COST OF PROJECT	**$212,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$15,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$1,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$36,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (521696 kW-hr @ 0.08 $/kW-hr)	$42,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$94,000**
Available Project Yield (acft/yr)	673
Annual Cost of Water ($ per acft), based on PF=1	$140
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$117
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.43
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.36

Note: One or more cost element has been calculated externally

Kiera Brown *9/10/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Lakeway MUD - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0.8 MGD)	$0
Transmission Pipeline (8 in dia., miles)	$0
Transmission Pump Station(s) & Storage Tank(s)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$1,952,000
TOTAL COST OF FACILITIES	**$1,952,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$683,000
Environmental & Archaeology Studies and Mitigation	$13,000
Land Acquisition and Surveying (20 acres)	$14,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$74,000
TOTAL COST OF PROJECT	**$2,736,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$192,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$20,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (791395 kW-hr @ 0.08 $/kW-hr)	$63,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$275,000**
Available Project Yield (acft/yr)	900
Annual Cost of Water ($ per acft), based on PF=1	$306
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$92
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.94
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.28

Kiera Brown *9/30/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Travis County WCID 17 - Direct Reuse

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	Estimated Costs for Facilities
Primary Pump Station (0 MGD)	$1,246,000
Transmission Pipeline (0 in dia., miles)	$0
Storage Tanks (Other Than at Booster Pump Stations)	$5,264,000
TOTAL COST OF FACILITIES	**$6,510,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (35% for pipes & 35% for all other facilities)	$2,278,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$242,000
TOTAL COST OF PROJECT	**$9,030,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$635,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$53,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$31,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (0 kW-hr @ 0.08 $/kW-hr)	$0
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$719,000**
Available Project Yield (acft/yr)	510
Annual Cost of Water ($ per acft), based on PF=1	$1,410
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$165
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.33
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.51

Note: One or more cost element has been calculated externally

Kiera Brown *9/11/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Steam Electric, Matagorda, Colorado - Alternate Canal Delivery

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (0 MGD)	$12,332,000
Transmission Pipeline (0 in dia., miles)	$732,000
TOTAL COST OF FACILITIES	**$13,064,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$4,536,000
Environmental & Archaeology Studies and Mitigation	$21,000
Land Acquisition and Surveying (5 acres)	$20,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$486,000
TOTAL COST OF PROJECT	**$18,127,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$1,276,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$7,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$308,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (931970 kW-hr @ 0.08 $/kW-hr)	$75,000
Purchase of Water (12727 acft/yr @ 135 $/acft)	$1,718,000
TOTAL ANNUAL COST	**$3,384,000**
Available Project Yield (acft/yr)	12,727
Annual Cost of Water ($ per acft), based on PF=4	$266
Annual Cost of Water After Debt Service ($ per acft), based on PF=4	$166
Annual Cost of Water ($ per 1,000 gallons), based on PF=4	$0.82
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=4	$0.51

Erin Hynes *4/18/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Alternative Expand Use of GW in Bastrop County (Carrizo-Wilcox Aquifer)

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station (0 MGD)	$4,768,000
Transmission Pipeline (0 in dia., miles)	$6,715,000
Well Fields (Wells, Pumps, and Piping)	$15,756,000
TOTAL COST OF FACILITIES	**$27,239,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$9,198,000
Environmental & Archaeology Studies and Mitigation	$496,000
Land Acquisition and Surveying (27 acres)	$185,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,021,000
TOTAL COST OF PROJECT	**$38,139,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,683,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$225,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$119,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (17850223 kW-hr @ 0.08 $/kW-hr)	$1,428,000
Purchase of Water (25000 acft/yr @ 11.4 $/acft)	$285,000
TOTAL ANNUAL COST	**$4,740,000**
Available Project Yield (acft/yr)	25,000
Annual Cost of Water ($ per acft), based on PF=1	$190
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$82
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$0.58
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.25

Kiera Brown *12/26/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - LCRA Brackish Groundwater Desalination Strategy

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	*Estimated Costs for Facilities*
Primary Pump Station	$8,881,000
Transmission Pipeline	$20,020,000
Well Fields (Wells, Pumps, and Piping)	$69,033,000
Storage Tanks (Other Than at Booster Pump Stations)	$1,736,000
Water Treatment Plant (25 MGD)	$65,377,000
TOTAL COST OF FACILITIES	**$165,047,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$56,766,000
Environmental & Archaeology Studies and Mitigation	$806,000
Land Acquisition and Surveying (57 acres)	$257,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$6,130,000
TOTAL COST OF PROJECT	**$229,006,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$16,113,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$908,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$222,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$11,887,000
Advanced Water Treatment Facility	$0
Pumping Energy Costs (25862457 kW-hr @ 0.08 $/kW-hr)	$2,069,000
Purchase of Water (acft/yr @ $/acft)	$0
TOTAL ANNUAL COST	**$31,199,000**
Available Project Yield (acft/yr)	22,400
Annual Cost of Water ($ per acft), based on PF=1	$1,393
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$673
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$4.27
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$2.07

Erin Hynes *10/15/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
LCRA - Alternative Supplement Environmental Flows with Brackish Groundwater

Cost based on ENR CCI 202.4 for September 2018 and a PPI of for November 1932

Item	***Estimated Costs for Facilities***
CAPITAL COST	
Well Fields (Wells, Pumps, and Piping)	$26,073,000
TOTAL COST OF FACILITIES	**$26,073,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (externally calculated; includes mobilization)	$19,293,000
Environmental & Archaeology Studies and Mitigation	$570,000
Land Acquisition and Surveying	$137,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,196,000
TOTAL COST OF PROJECT	**$47,269,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$3,142,000
Reservoir Debt Service (3.5 percent, 40 years)	$0
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (3% of Cost of Facilities)	$782,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$0
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Well Pump Replacement	$657,000
Pumping Energy Costs (7500636 kW-hr @ 0.08 $/kW-hr)	$600,000
WR Royalty Payment (12000 acft/yr @ 100 $/acft)	$1,200,000
TOTAL ANNUAL COST	**$6,381,000**
Available Project Yield (acft/yr)	12,000
Annual Cost of Water ($ per acft), based on PF=1	$532
Annual Cost of Water After Debt Service ($ per acft), based on PF=1	$270
Annual Cost of Water ($ per 1,000 gallons), based on PF=1	$1.63
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=1	$0.83

Note: One or more cost element has been calculated externally

Kiera Brown *8/26/2019*

Cost Estimate Summary
Water Supply Project Option
September 2018 Prices
Alternative Aqua WSC - Carrizo-Wilcox Aquifer - Expand Local Use of Groundwater

Cost based on ENR CCI 11170.28 for September 2018 and a PPI of 202.4 for September 2018

Item	***Estimated Costs for Facilities***
Primary Pump Station (23.9 MGD)	$8,227,000
Transmission Pipeline (42 in dia., miles)	$2,532,000
Well Fields (Wells, Pumps, and Piping)	$16,077,000
TOTAL COST OF FACILITIES	**$26,836,000**
Engineering and Feasibility Studies, Legal Assistance, Financing, Bond Counsel, and Contingencies (30% for pipes & 35% for all other facilities)	$9,266,000
Environmental & Archaeology Studies and Mitigation	$421,000
Land Acquisition and Surveying (32 acres)	$150,000
Interest During Construction (3% for 1 years with a 0.5% ROI)	$1,009,000
TOTAL COST OF PROJECT	**$37,682,000**
ANNUAL COST	
Debt Service (3.5 percent, 20 years)	$2,651,000
Operation and Maintenance	
Pipeline, Wells, and Storage Tanks (1% of Cost of Facilities)	$186,000
Intakes and Pump Stations (2.5% of Cost of Facilities)	$206,000
Dam and Reservoir (1.5% of Cost of Facilities)	$0
Water Treatment Plant	$0
Advanced Water Treatment Facility	$0
Pumping Energy Costs (11985938 kW-hr @ 0.08 $/kW-hr)	$959,000
Purchase of Water (19121 acft/yr @ 11.4 $/acft)	$218,000
TOTAL ANNUAL COST	**$4,220,000**
Available Project Yield (acft/yr)	19,121
Annual Cost of Water ($ per acft), based on PF=2	$221
Annual Cost of Water After Debt Service ($ per acft), based on PF=2	$82
Annual Cost of Water ($ per 1,000 gallons), based on PF=2	$0.68
Annual Cost of Water After Debt Service ($ per 1,000 gallons), based on PF=2	$0.25

Kiera Brown *8/15/2019*

APPENDIX 5E

TWDB DB22 REPORTS

WUG Second Tier Needs Summary

WUG Second Tier Needs

WUG Unmet Needs Summary

WUG Unmet Needs

WUG Recommended Water Management Strategies

Recommended Projects Associated with Water Management Strategies

WUG Alternative Water Management Strategies

Alternative Projects Associated with Water Management Strategies

Major Water Provider Water Management Strategy Summary

Region K Water User Group (WUG) Second-Tier Identified Water Needs Summary

Second-tier needs are WUG split needs adjusted to include the implementation of recommended demand reduction and direct reuse water management strategies.

WUG CATEGORY	NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MUNICIPAL	283	1,717	11,202	16,031	28,061	41,618
COUNTY-OTHER	308	400	507	613	697	1,323
MANUFACTURING	0	40	40	40	40	40
MINING	1,740	5,194	6,056	5,575	3,372	4,060
STEAM ELECTRIC POWER	20,066	19,986	19,906	19,826	19,826	19,826
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	170,277	141,583	112,321	86,033	65,198	53,607

Region K Water User Group (WUG) Second-Tier Identified Water Needs

Second-tier needs are WUG split needs adjusted to include the implementation of recommended demand reduction and direct reuse water management strategies.

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
BASTROP COUNTY - BRAZOS BASIN						
AQUA WSC*	0	0	0	0	0	0
LEE COUNTY WSC*	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BASTROP COUNTY - COLORADO BASIN						
AQUA WSC*	0	254	2,506	5,218	11,415	19,062
BASTROP	0	0	0	638	1,813	3,376
BASTROP COUNTY WCID 2	0	0	0	0	348	1,049
CREEDMOOR-MAHA WSC*	0	0	0	0	0	0
ELGIN	0	0	0	0	804	1,874
LEE COUNTY WSC*	0	0	0	0	0	0
POLONIA WSC*	0	0	0	0	0	0
SMITHVILLE	0	0	0	0	0	645
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	449	3,947	4,557	3,220	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BASTROP COUNTY - GUADALUPE BASIN						
AQUA WSC*	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BLANCO COUNTY - COLORADO BASIN						
JOHNSON CITY	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BLANCO COUNTY - GUADALUPE BASIN						
BLANCO	0	0	0	0	0	0
CANYON LAKE WATER SERVICE*	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BURNET COUNTY - BRAZOS BASIN						
BERTRAM	0	0	0	0	8	36
BURNET	0	0	0	0	0	0
GEORGETOWN*	0	0	0	0	0	0
KEMPNER WSC*	0	0	0	0	0	0

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
BURNET COUNTY - BRAZOS BASIN						
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	116	368	655
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
BURNET COUNTY - COLORADO BASIN						
BURNET	0	0	0	0	0	0
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
COTTONWOOD SHORES	0	0	0	0	0	0
GRANITE SHOALS	0	0	0	0	3	169
HORSESHOE BAY	0	0	0	0	0	0
KINGSLAND WSC	0	0	0	0	0	0
MARBLE FALLS	0	0	0	0	0	0
MEADOWLAKES	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	326	1,052	1,708	2,464	2,826
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
COLORADO COUNTY - BRAZOS-COLORADO BASIN						
EAGLE LAKE	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	11,896	9,061	6,115	3,554	1,371	0
COLORADO COUNTY - COLORADO BASIN						
COLUMBUS	0	0	0	0	0	0
CORIX UTILITIES TEXAS INC*	0	0	0	1	2	3
EAGLE LAKE	0	0	0	0	0	0
WEIMAR	0	0	0	0	0	0
COUNTY-OTHER	0	8	29	67	100	133
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	228	228	228	228	228	228
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	3,697	2,315	912	0	0	0
COLORADO COUNTY - LAVACA BASIN						
WEIMAR	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	4,743	4,743	4,743	4,743	4,743	4,743
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	14,932	10,716	6,381	2,542	0	0
FAYETTE COUNTY - COLORADO BASIN						
AQUA WSC*	0	0	0	0	0	0
FAYETTE COUNTY WCID MONUMENT HILL	0	0	0	0	0	0

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
FAYETTE COUNTY - COLORADO BASIN						
FAYETTE WSC	0	0	0	0	0	0
LA GRANGE	0	0	0	0	0	0
LEE COUNTY WSC*	0	0	0	0	0	0
WEST END WSC*	0	0	0	0	0	0
COUNTY-OTHER	0	40	98	145	180	204
MANUFACTURING	0	0	0	0	0	0
MINING	760	360	0	0	0	0
STEAM ELECTRIC POWER	3,819	3,739	3,659	3,579	3,579	3,579
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
FAYETTE COUNTY - GUADALUPE BASIN						
FAYETTE WSC	0	0	0	0	0	0
FLATONIA	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
FAYETTE COUNTY - LAVACA BASIN						
FAYETTE WSC	0	0	0	0	0	0
FLATONIA	0	0	0	0	0	0
SCHULENBURG	0	0	0	0	0	0
COUNTY-OTHER	308	352	380	401	417	428
MANUFACTURING	0	40	40	40	40	40
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
GILLESPIE COUNTY - COLORADO BASIN						
FREDERICKSBURG	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
GILLESPIE COUNTY - GUADALUPE BASIN						
COUNTY-OTHER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
HAYS COUNTY - COLORADO BASIN						
AUSTIN	0	0	0	0	0	0
BUDA*	0	0	0	0	0	0
CIMARRON PARK WATER	0	0	0	0	0	0
DEER CREEK RANCH WATER	0	0	0	0	0	0
DRIPPING SPRINGS WSC	0	0	0	141	1,137	1,631
GOFORTH SUD*	52	103	156	216	288	366
HAYS	0	8	55	98	168	246
HAYS COUNTY WCID 1	0	0	0	0	0	0
HAYS COUNTY WCID 2	0	0	0	0	0	0
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	0	0	0	0	0	0

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
HAYS COUNTY - COLORADO BASIN						
COUNTY-OTHER*	0	0	0	0	0	558
MANUFACTURING*	0	0	0	0	0	0
MINING	531	561	447	531	540	579
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK*	0	0	0	0	0	0
IRRIGATION*	0	0	0	0	0	0
LLANO COUNTY - COLORADO BASIN						
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
HORSESHOE BAY	0	0	0	0	0	0
KINGSLAND WSC	0	0	0	0	0	0
LLANO	176	0	0	0	0	0
SUNRISE BEACH VILLAGE	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
MATAGORDACOUNTY - BRAZOS-COLORADO BASIN						
BAY CITY	0	0	0	0	0	0
CANEY CREEK MUD OF MATAGORDA COUNTY	0	0	0	0	0	0
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
MATAGORDA COUNTY WCID 6	0	0	0	0	0	0
MATAGORDA WASTE DISPOSAL & WSC	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	51,009	45,863	40,665	35,809	31,295	26,839
MATAGORDACOUNTY - COLORADO BASIN						
BAY CITY	0	0	0	0	0	0
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
MATAGORDA WASTE DISPOSAL & WSC	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	11,276	11,276	11,276	11,276	11,276	11,276
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	420	351	284	220	158	98
MATAGORDACOUNTY - COLORADO-LAVACABASIN						
MARKHAM MUD	0	0	0	0	0	0
PALACIOS	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	50,059	44,838	39,569	34,640	30,052	25,522
MILLS COUNTY - BRAZOS BASIN						
GOLDTHWAITE	0	0	0	0	0	0

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MILLS COUNTY - BRAZOS BASIN						
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	1,129	1,133	1,137	1,141	1,144	1,148
MILLS COUNTY - COLORADO BASIN						
BROOKESMITH SUD*	0	0	0	0	0	0
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
GOLDTHWAITE	0	0	0	0	0	0
ZEPHYR WSC*	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
SAN SABA COUNTY - COLORADO BASIN						
CORIX UTILITIES TEXAS INC*	0	0	0	0	0	0
NORTH SAN SABA WSC	0	0	0	0	0	0
RICHLAND SUD*	0	0	0	0	0	0
SAN SABA	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
TRAVIS COUNTY - COLORADO BASIN						
AQUA WSC*	0	0	0	0	0	0
AUSTIN	0	0	0	0	0	0
BARTON CREEK WEST WSC	0	0	0	0	0	0
BARTON CREEK WSC	51	75	88	81	68	56
BRIARCLIFF	0	0	0	0	0	0
CEDAR PARK*	0	0	0	0	0	0
COTTONWOOD CREEK MUD 1	0	0	0	0	0	0
CREEDMOOR-MAHA WSC*	0	0	360	430	524	615
CYPRESS RANCH WCID 1	0	0	0	0	0	0
DEER CREEK RANCH WATER	0	0	0	0	0	0
ELGIN	0	0	0	0	0	0
GARFIELD WSC	0	0	0	7	26	47
HORNSBY BEND UTILITY	0	0	0	0	0	0
HURST CREEK MUD	0	0	0	0	0	0
JONESTOWN WSC	0	0	0	0	0	0
KELLY LANE WCID 1	0	0	0	0	0	0
LAGO VISTA	0	0	0	0	0	0
LAKEWAY MUD	0	0	0	0	0	0
LEANDER*	0	1,272	1,393	2,039	2,308	2,595
LOOP 360 WSC	0	0	0	0	0	0
MANOR	0	0	0	0	0	0
MANVILLE WSC*	0	0	0	0	0	703

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Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRAVIS COUNTY - COLORADO BASIN						
NORTH AUSTIN MUD 1	0	0	72	71	71	71
NORTHTOWN MUD	0	0	900	1,013	1,112	1,205
OAK SHORES WATER SYSTEM	0	0	0	0	0	0
PFLUGERVILLE*	0	0	0	490	2,458	2,385
ROLLINGWOOD	0	0	228	206	186	183
ROUGH HOLLOW IN TRAVIS COUNTY	0	0	0	0	0	0
ROUND ROCK*	0	0	0	0	0	0
SENNA HILLS MUD	0	0	0	0	0	0
SHADY HOLLOW MUD	0	0	0	0	0	0
SUNSET VALLEY	0	0	248	261	274	288
SWEETWATER COMMUNITY	0	0	0	0	0	0
TRAVIS COUNTY MUD 10	0	0	0	0	0	0
TRAVIS COUNTY MUD 14	0	0	0	2	17	35
TRAVIS COUNTY MUD 2	0	0	0	0	0	0
TRAVIS COUNTY MUD 4	0	0	0	0	0	0
TRAVIS COUNTY WCID 10	0	0	2,297	2,245	2,161	2,063
TRAVIS COUNTY WCID 17	0	0	0	0	0	0
TRAVIS COUNTY WCID 18	0	0	0	0	0	0
TRAVIS COUNTY WCID 19	0	0	0	0	0	0
TRAVIS COUNTY WCID 20	0	0	0	0	0	0
TRAVIS COUNTY WCID POINT VENTURE	0	0	0	0	0	41
WELLS BRANCH MUD	0	0	1,255	1,238	1,233	1,232
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	0	0	0	0	0	0
WILLIAMSON COUNTY WSID 3*	0	0	0	0	0	0
WILLIAMSON TRAVIS COUNTIES MUD 1*	0	0	0	0	0	0
WINDERMERE UTILITY	0	0	873	873	873	873
COUNTY-OTHER	0	0	0	0	0	0
COUNTY-OTHER | AQUA TEXAS - RIVERCREST	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	0	0	0	0	0	0
STEAM ELECTRIC POWER	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	0	0	0	0	0	0
TRAVIS COUNTY - GUADALUPE BASIN						
CREEDMOOR-MAHA WSC*	0	0	0	0	0	0
GOFORTH SUD*	4	5	9	14	19	24
COUNTY-OTHER	0	0	0	0	0	0
MINING	0	0	0	0	0	0
LIVESTOCK	0	0	0	0	0	0
WHARTON COUNTY - BRAZOS-COLORADO BASIN						
BOLING MWD	0	0	0	0	0	0
WHARTON	0	0	0	0	0	0
WHARTON COUNTY WCID 2	0	0	0	0	0	0
COUNTY-OTHER*	0	0	0	0	0	0
MANUFACTURING*	0	0	0	0	0	0
MINING*	0	0	0	0	0	0
STEAM ELECTRIC POWER*	0	0	0	0	0	0

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Region K Water User Group (WUG) Second-Tier Identified Water Needs

	WUG SECOND-TIER NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
WHARTON COUNTY - BRAZOS-COLORADO BASIN						
LIVESTOCK*	0	0	0	0	0	0
IRRIGATION*	25,508	19,079	12,489	6,522	1,178	0
WHARTON COUNTY - COLORADO BASIN						
EL CAMPO*	0	0	0	0	0	0
WHARTON	0	0	0	0	0	0
COUNTY-OTHER*	0	0	0	0	0	0
MANUFACTURING*	0	0	0	0	0	0
MINING*	0	0	0	0	0	0
STEAM ELECTRIC POWER*	0	0	0	0	0	0
LIVESTOCK*	0	0	0	0	0	0
IRRIGATION*	11,627	8,227	4,769	1,605	0	0
WHARTON COUNTY - COLORADO-LAVACA BASIN						
COUNTY-OTHER*	0	0	0	0	0	0
MINING*	0	0	0	0	0	0
LIVESTOCK*	0	0	0	0	0	0
IRRIGATION*	0	0	0	0	0	0
WHARTON COUNTY - LAVACA BASIN						
COUNTY-OTHER*	0	0	0	0	0	0
WILLIAMSON COUNTY - BRAZOS BASIN						
AUSTIN	0	0	0	0	0	0
NORTH AUSTIN MUD 1	0	0	690	678	675	675
WELLS BRANCH MUD	0	0	72	71	70	70
COUNTY-OTHER*	0	0	0	0	0	0
MANUFACTURING*	0	0	0	0	0	0
MINING*	0	0	0	0	0	0

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Region K Water User Group (WUG) Unmet Needs Summary

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs Summary report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. Before aggregating the difference between supplies and demands to the WUG category level, calculated surpluses are updated to zerc so that only the WUGs with unmet needs in the decade are included with the Needs totals. Unmet needs water volumes are shown as absolute values.

WUG CATEGORY	NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
MUNICIPAL	0	0	0	0	0	0
COUNTY-OTHER	0	0	0	0	0	0
MANUFACTURING	0	0	0	0	0	0
MINING	449	3,947	4,557	3,220	0	0
STEAM ELECTRIC POWER	4,971	4,971	4,971	4,971	4,971	4,971
LIVESTOCK	0	0	0	0	0	0
IRRIGATION	75,896	84,490	70,054	62,648	53,500	44,455

Region K Water User Group (WUG) Unmet Needs

WUG supplies and projected demands are entered for each of a WUG's region-county-basin divisions. The unmet needs shown in the WUG Unmet Needs report are calculated by first deducting the WUG split's projected demand from the sum of its total existing water supply volume and all associated recommended water management strategy water volumes. If the WUG split has a greater future supply volume than projected demand in any given decade, this amount is considered a surplus volume. In order to display only unmet needs associated with the WUG split, these surplus volumes are updated to a zero and the unmet needs water volumes are shown as absolute values.

	WUG UNMET NEEDS (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
BASTROP COUNTY - COLORADO BASIN						
MINING	449	3,947	4,557	3,220	0	0
COLORADO COUNTY - BRAZOS-COLORADO BASIN						
IRRIGATION	2,886	2,811	1,217	0	0	0
COLORADO COUNTY - COLORADO BASIN						
STEAM ELECTRIC POWER	228	228	228	228	228	228
IRRIGATION	1,124	635	0	0	0	0
COLORADO COUNTY - LAVACA BASIN						
STEAM ELECTRIC POWER	4,743	4,743	4,743	4,743	4,743	4,743
IRRIGATION	1,761	1,055	0	0	0	0
MATAGORDACOUNTY - BRAZOS-COLORADO BASIN						
IRRIGATION	34,428	37,223	33,935	31,579	27,033	22,537
MATAGORDACOUNTY - COLORADO-LAVACA BASIN						
IRRIGATION	33,487	36,071	32,689	30,228	25,623	21,070
MILLS COUNTY - BRAZOS BASIN						
IRRIGATION	829	833	837	841	844	848
WHARTON COUNTY - BRAZOS-COLORADO BASIN						
IRRIGATION*	0	3,173	380	0	0	0
WHARTON COUNTY - COLORADO BASIN						
IRRIGATION*	1,381	2,689	996	0	0	0

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
AQUA WSC*	K	DOWNSTREAM RETURN FLOWS	K | COLORADO INDIRECT REUSE	N/A	$145	0	0	0	0	0	1,200
AQUA WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	1,971	2,558	3,380	4,321	5,670	7,447
AQUA WSC*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | CARRIZO-WILCOX AQUIFER | BASTROP COUNTY	N/A	$1001	0	300	350	550	800	800
AQUA WSC*	K	LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	G | BRAZOS RUN-OF-RIVER	N/A	$145	0	0	2,500	6,000	12,000	18,800
AQUA WSC*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$3167	N/A	464	274	128	36	0	0
AQUA WSC*	L	MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION	$770	$770	8	13	20	30	45	63
AUSTIN	K	AUSTIN - AQUIFER STORAGE AND RECOVERY	K | CARRIZO-WILCOX AQUIFER ASR | BASTROP COUNTY	N/A	$2234	0	0	7,900	10,500	13,200	15,800
AUSTIN	K	AUSTIN - BLACKWATER AND GREYWATER REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$0	0	1,450	3,450	5,400	7,340	9,290
AUSTIN	K	AUSTIN - BRACKISH GROUNDWATER DESALINATION	K | EDWARDS-BFZ AQUIFER SALINE | TRAVIS COUNTY	N/A	$2995	0	0	0	0	0	2,700
AUSTIN	K	AUSTIN - BRACKISH GROUNDWATER DESALINATION	K | TRINITY AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$2995	0	0	0	0	0	2,300
AUSTIN	K	AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	K | COLORADO RUN-OF-RIVER	N/A	$213	0	0	3,000	3,000	3,000	3,000
AUSTIN	K	AUSTIN - CENTRALIZED DIRECT NON-POTABLE REUSE	K | DIRECT NON-POTABLE REUSE	$995	$995	500	2,990	10,250	14,583	18,917	23,250
AUSTIN	K	AUSTIN - COMMUNITY-SCALE STORMWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	66	158	184	210	236
AUSTIN	K	AUSTIN - CONSERVATION	DEMAND REDUCTION	$1343	$1343	4,910	14,890	24,870	30,120	35,370	40,620
AUSTIN	K	AUSTIN - DECENTRALIZED DIRECT NON-POTABLE REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$24	0	1,400	4,160	8,330	12,510	16,680
AUSTIN	K	AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	K | COLORADO INDIRECT REUSE	N/A	$457	0	0	11,000	14,000	17,000	20,000
AUSTIN	K	AUSTIN - LAKE AUSTIN OPERATIONS	K | COLORADO RUN-OF-RIVER	$218	$218	2,500	2,500	2,500	2,500	2,500	2,500
AUSTIN	K	AUSTIN - LONGHORN DAM OPERATION IMPROVEMENTS	K | COLORADO RUN-OF-RIVER	N/A	$393	0	3,000	3,000	3,000	3,000	3,000
AUSTIN	K	AUSTIN - OFF-CHANNEL RESERVOIR AND EVAPORATION SUPPRESSION	K | AUSTIN OFF-CHANNEL LAKE/RESERVOIR	N/A	$1018	0	0	0	0	0	25,827
AUSTIN	K	AUSTIN - ONSITE RAINWATER AND STORMWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	790	1,880	2,890	3,890	4,900
AUSTIN	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$11	$11	23,589	23,466	23,342	23,219	23,095	22,972
AUSTIN	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	8,266	9,708	11,281	12,423	13,389	14,666
BARTON CREEK WEST WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	79	71	64	58	52	47
BARTON CREEK WEST WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$429	$429	39	76	109	139	167	193
BARTON CREEK WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	119	127	131	130	125	121

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
BARTON CREEK WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$397	$397	47	110	183	258	330	409
BARTON CREEK WSC	K	WATER PURCHASE AMENDMENT - BARTON CREEK WSC	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$1629	$1629	90	90	90	90	90	90
BASTROP	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	372	471	631	849	1,143	1,534
BASTROP	K	LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	G | BRAZOS RUN-OF-RIVER	N/A	$145	0	0	0	1,000	2,500	4,000
BASTROP	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1109	$1109	184	355	433	558	744	992
BASTROP COUNTY WCID 2	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	24	35	49	68	94	129
BASTROP COUNTY WCID 2	K	LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	G | BRAZOS RUN-OF-RIVER	N/A	$145	0	0	0	0	500	1,500
BAY CITY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	583	594	597	606	615	622
BAY CITY	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | MATAGORDA COUNTY	N/A	$53	0	75	75	75	75	75
BERTRAM	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	78	85	88	89	94	101
BERTRAM	K	EXPANDED USE OF LOCAL GROUNDWATER	K | ELLENBURGER-SAN SABA AQUIFER | BURNET COUNTY	N/A	$1235	0	750	2,000	2,000	2,000	2,000
BERTRAM	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$541	$541	39	85	142	205	238	257
BLANCO	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$705	0	146	146	146	146	146
BLANCO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	63	55	60	63	65	66
BLANCO	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	N/A	$5265	0	27	23	21	21	21
BOLING MWD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	12	9	7	6	6	6
BRIARCLIFF	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	60	68	76	85	93	106
BROOKESMITH SUD*	F	WATER AUDITS AND LEAK - BROOKESMITH SUD	DEMAND REDUCTION	$2569	$2711	1	1	1	1	1	1
BROOKESMITH SUD*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	1	1	1	1	2	2
BUDA*	K	DIRECT POTABLE REUSE	K | DIRECT POTABLE REUSE	$1440	$1440	2,240	2,240	2,240	2,240	2,240	2,240
BUDA*	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	$0	$0	100	920	520	520	880	680
BUDA*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	322	443	607	813	1,045	1,309
BUDA*	K	EDWARDS / MIDDLE TRINITY ASR	K | TRINITY AQUIFER ASR | HAYS COUNTY	$1398	$1398	150	600	600	600	600	600
BUDA*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1148	$1148	159	292	382	499	636	793
BUDA*	K	SALINE EDWARDS DESALINATION AND ASR	K | EDWARDS-BFZ AQUIFER SALINE | TRAVIS COUNTY	N/A	$1951	0	0	800	800	800	800
BUDA*	L	ARWA - PHASE 2	L | CARRIZO-WILCOX AQUIFER | CALDWELL COUNTY	N/A	$200	0	0	1,067	1,067	1,067	1,067
BUDA*	L	ARWA/GBRA PROJECT (PHASE 1)	L | CARRIZO-WILCOX AQUIFER | CALDWELL COUNTY	$1430	$358	762	762	762	762	762	762
BUDA*	L	MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION	$681	$681	11	42	61	90	126	172
BURNET	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	302	329	339	362	397	427

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
BURNET	K	LCRA - EXCESS FLOWS RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$719	0	1,000	2,000	2,000	2,000	2,000
BURNET	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$684	$684	150	330	545	694	757	813
CANEY CREEK MUD OF MATAGORDA COUNTY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	26	19	13	13	13	13
CANYON LAKE WATER SERVICE*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	11	14	16	20	23	27
CANYON LAKE WATER SERVICE*	L	GBRA LOWER BASIN STORAGE PROJECT	L | GBRA LOWER BASIN OFF-CHANNEL LAKE/RESERVOIR	N/A	$49	0	0	0	0	0	3
CANYON LAKE WATER SERVICE*	L	MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	1	6	12
CEDAR PARK*	G	BRUSHY CREEK RUA-EXISTING CONTRACTS	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$836	N/A	170	175	15	0	0	0
CEDAR PARK*	G	MUNICIPAL WATER CONSERVATION - CEDAR PARK	DEMAND REDUCTION	N/A	$560	0	215	442	633	791	829
CEDAR PARK*	G	REUSE- CEDAR PARK	G | DIRECT NON-POTABLE REUSE	$543	$92	132	127	136	136	136	136
CEDAR PARK*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	410	393	393	393	393	393
CEDAR PARK*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$824	$824	203	420	590	586	583	582
CIMARRON PARK WATER	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	18	12	12	11	11	11
COLUMBUS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	206	194	180	169	157	146
COLUMBUS	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$537	$537	102	195	286	384	484	581
CORIX UTILITIES TEXAS INC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	77	82	86	89	93	98
CORIX UTILITIES TEXAS INC*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | COLORADO COUNTY	N/A	$50	0	0	0	1	2	4
COTTONWOOD CREEK MUD 1	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	5	5	6	6	7	7
COTTONWOOD SHORES	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	45	53	61	68	75	80
COTTONWOOD SHORES	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2512	$2512	22	26	27	28	29	32
COUNTY-OTHER, BASTROP	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	258	283	332	398	489	610
COUNTY-OTHER, BASTROP	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1264	$1264	128	204	225	263	317	392
COUNTY-OTHER, BLANCO	K	BRUSH MANAGEMENT	K | TRINITY AQUIFER | BLANCO COUNTY	N/A	$1190	0	708	708	708	708	708
COUNTY-OTHER, BLANCO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	123	114	103	98	95	94
COUNTY-OTHER, BURNET	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	683	759	759	834	904	968
COUNTY-OTHER, BURNET	K	LCRA - EXCESS FLOWS RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$779	0	3,141	5,397	5,397	5,397	5,397
COUNTY-OTHER, BURNET	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2090	$2090	175	253	198	190	195	205
COUNTY-OTHER, COLORADO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	170	135	106	92	92	93

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
COUNTY-OTHER, COLORADO	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | COLORADO COUNTY	N/A	$1218	0	133	133	133	133	133
COUNTY-OTHER, FAYETTE	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | SPARTA AQUIFER | FAYETTE COUNTY	$1693	$1693	400	400	400	400	400	400
COUNTY-OTHER, FAYETTE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	189	177	161	156	159	163
COUNTY-OTHER, FAYETTE	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | FAYETTE COUNTY	$49	$49	1	1	20	41	41	41
COUNTY-OTHER, FAYETTE	K	EXPANDED USE OF LOCAL GROUNDWATER	K | SPARTA AQUIFER | FAYETTE COUNTY	N/A	$1127	0	40	98	145	180	204
COUNTY-OTHER, GILLESPIE	K	BRUSH MANAGEMENT	K | EDWARDS-TRINITY-PLATEAU, PECOS VALLEY, AND TRINITY AQUIFERS | GILLESPIE COUNTY	N/A	$1190	0	1,125	1,125	1,125	1,125	1,125
COUNTY-OTHER, GILLESPIE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	150	109	94	99	104	109
COUNTY-OTHER, HAYS*	K	BRUSH MANAGEMENT	K | TRINITY AQUIFER | HAYS COUNTY	N/A	$1190	0	83	83	83	83	83
COUNTY-OTHER, HAYS*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	158	103	132	155	176	243
COUNTY-OTHER, HAYS*	K	EDWARDS / MIDDLE TRINITY ASR	K | TRINITY AQUIFER ASR | HAYS COUNTY	N/A	$2190	0	289	289	289	289	289
COUNTY-OTHER, HAYS*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | HAYS COUNTY	N/A	$1180	0	0	0	0	0	200
COUNTY-OTHER, HAYS*	K	RAINWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	16	24	31	36	50
COUNTY-OTHER, HAYS*	K	SALINE EDWARDS DESALINATION AND ASR	K | EDWARDS-BFZ AQUIFER SALINE | TRAVIS COUNTY	N/A	$1951	0	0	500	500	500	500
COUNTY-OTHER, HAYS*	L	GBRA - MBWSP	L | CARRIZO-WILCOX AQUIFER ASR FRESH/BRACKISH | GONZALES COUNTY	N/A	$596	0	1,000	1,000	1,000	1,000	1,000
COUNTY-OTHER, LLANO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	13	10	11	11	10	9
COUNTY-OTHER, MATAGORDA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	52	53	52	53	53	53
COUNTY-OTHER, MILLS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	50	41	32	31	31	32
COUNTY-OTHER, SAN SABA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	44	44	43	43	43	44
COUNTY-OTHER, TRAVIS	K	BRUSH MANAGEMENT	K | TRINITY AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$1190	0	83	83	83	83	83
COUNTY-OTHER, TRAVIS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	232	221	214	206	197	192
COUNTY-OTHER, TRAVIS	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$7585	$7585	29	55	79	102	123	142
COUNTY-OTHER, WHARTON*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	315	269	234	239	243	249
COUNTY-OTHER, WILLIAMSON*	G	MUNICIPAL WATER CONSERVATION - COUNTY-OTHER, WILLIAMSON	DEMAND REDUCTION	N/A	$560	0	7	9	9	8	7
COUNTY-OTHER, WILLIAMSON*	G	STORAGE REALLOCATION OF LAKE WHITNEY	G | BRAZOS RIVER AUTHORITY MAIN STEM LAKE/RESERVOIR SYSTEM	N/A	$576	0	0	0	52	23	15
COUNTY-OTHER, WILLIAMSON*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	13	19	18	17	16	15

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
CREEDMOOR-MAHA WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	31	33	35	38	41	45
CREEDMOOR-MAHA WSC*	K	EDWARDS / MIDDLE TRINITY ASR	K | TRINITY AQUIFER ASR | HAYS COUNTY	N/A	$2190	0	289	289	289	289	289
CREEDMOOR-MAHA WSC*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2506	$2506	32	39	59	92	99	106
CREEDMOOR-MAHA WSC*	K	WATER PURCHASE AMENDMENT - CREEDMOOR-MAHA WSC	K | CARRIZO-WILCOX AQUIFER | BASTROP COUNTY	N/A	$1222	0	0	335	335	335	335
CYPRESS RANCH WCID 1	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	6	6	7	7	7	7
CYPRESS RANCH WCID 1	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2502	$2502	6	9	14	20	21	20
DEER CREEK RANCH WATER	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	3	3	5	5	5	5
DRIPPING SPRINGS WSC	K	DIRECT POTABLE REUSE	K | DIRECT POTABLE REUSE	N/A	$2582	0	560	560	560	560	560
DRIPPING SPRINGS WSC	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$251	0	390	460	531	601	672
DRIPPING SPRINGS WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	351	580	753	972	1,239	1,380
DRIPPING SPRINGS WSC	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | HAYS COUNTY	N/A	$1023	0	0	300	300	300	300
DRIPPING SPRINGS WSC	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	0	1,000	2,000	2,000
DRIPPING SPRINGS WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1593	$1593	174	289	339	417	522	576
DRIPPING SPRINGS WSC	K	RAINWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	34	44	57	73	81
EAGLE LAKE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	98	86	78	73	75	77
EL CAMPO*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	1	1	1	1	1	1
ELGIN	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | TRINITY AQUIFER | TRAVIS COUNTY	N/A	$953	0	0	0	0	1,000	1,050
ELGIN	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | TRINITY AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$953	0	0	0	0	0	775
ELGIN	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	254	258	239	190	247	321
ELGIN	K	EXPANDED USE OF LOCAL GROUNDWATER	K | CARRIZO-WILCOX AQUIFER | BASTROP COUNTY	N/A	$80	0	0	0	0	50	50
ELGIN	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1208	$1208	79	144	271	486	625	807
FAYETTE COUNTY WCID MONUMENT HIL	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	33	32	31	30	30	31
FAYETTE COUNTY WCID MONUMENT HIL	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$563	$563	17	33	50	68	75	78
FAYETTE WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	144	149	151	155	161	166
FLATONIA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	63	65	64	69	72	74
FLATONIA	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1154	$1154	31	63	90	92	96	99
FREDERICKSBURG	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$5977	0	132	132	132	132	132
FREDERICKSBURG	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	610	589	560	535	508	504
FREDERICKSBURG	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$574	$574	302	598	903	1,234	1,578	1,802
GARFIELD WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	10	12	13	14	15	16

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
GARFIELD WSC	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | TRAVIS COUNTY	N/A	$85	0	0	0	7	26	47
GEORGETOWN*	G	ADDITIONAL ADVANCED CONSERVATION - GEORGETOWN	DEMAND REDUCTION	N/A	N/A	0	0	0	0	0	0
GEORGETOWN*	G	BELTON TO STILLHOUSE PIPELINE-BRA	G | BRA SYSTEM OPERATIONS PERMIT SUPPLY	N/A	N/A	0	0	0	0	0	0
GEORGETOWN*	G	BELTON TO STILLHOUSE PIPELINE-BRA	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	N/A	N/A	0	0	0	0	0	0
GEORGETOWN*	G	GEORGETOWN WTP EXPANSION	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	N/A	N/A	0	0	0	0	0	0
GEORGETOWN*	G	MUNICIPAL WATER CONSERVATION - GEORGETOWN	DEMAND REDUCTION	N/A	$560	0	8	19	31	44	56
GEORGETOWN*	G	REUSE- GEORGETOWN	G | DIRECT NON-POTABLE REUSE	N/A	$46	0	4	4	3	3	3
GEORGETOWN*	G	TRINITY- LAKE GEORGETOWN ASR	G | TRINITY AQUIFER ASR | WILLIAMSON COUNTY	N/A	$1417	0	0	23	21	19	17
GEORGETOWN*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	15	17	17	19	20	22
GEORGETOWN*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1326	$1326	8	17	28	35	39	41
GOFORTH SUD*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	8	11	13	17	21	26
GOFORTH SUD*	L	ARWA/GBRA PROJECT (PHASE 1)	L | CARRIZO-WILCOX AQUIFER | CALDWELL COUNTY	$721	$283	115	101	97	130	204	281
GOFORTH SUD*	L	ARWA/GBRA PROJECT (PHASE 1)	L | CARRIZO-WILCOX AQUIFER FRESH/BRACKISH | GONZALES COUNTY	$721	$283	117	102	98	100	103	109
GOFORTH SUD*	L	MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION	N/A	$681	0	0	0	0	0	3
GOLDTHWAITE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	73	68	69	72	75	78
GOLDTHWAITE	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1800	$1800	36	65	61	59	61	63
GRANITE SHOALS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	29	32	35	38	44	53
GRANITE SHOALS	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	0	0	50	170
HAYS	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | TRINITY AQUIFER | HAYS COUNTY	N/A	$3830	0	100	100	100	100	100
HAYS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	37	47	59	70	87	107
HAYS	K	EDWARDS / MIDDLE TRINITY ASR	K | TRINITY AQUIFER ASR | HAYS COUNTY	N/A	$3842	0	146	146	146	146	146
HAYS	K	NEW WATER PURCHASE - HAYS	K | EDWARDS-BFZ AQUIFER | HAYS COUNTY	N/A	$1536	0	0	0	0	70	140
HAYS	K	RAINWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	3	4	4	6	7
HAYS COUNTY WCID 1	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	149	134	121	114	114	114
HAYS COUNTY WCID 1	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$892	$892	74	136	196	226	225	225
HAYS COUNTY WCID 2	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	52	61	70	76	95	117
HAYS COUNTY WCID 2	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$598	$598	26	62	114	169	211	259
HORNSBY BEND UTILITY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	30	34	38	41	44	47

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
HORSESHOE BAY	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$669	0	154	154	154	154	154
HORSESHOE BAY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	641	640	601	576	537	495
HORSESHOE BAY	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	400	600	800	800
HORSESHOE BAY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$542	$542	253	540	815	1,114	1,392	1,645
HURST CREEK MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	313	281	253	228	205	185
HURST CREEK MUD	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$336	$336	155	302	437	560	673	776
IRRIGATION, COLORADO	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$11	$11	3,657	3,496	3,328	3,151	2,966	2,768
IRRIGATION, COLORADO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	8,385	8,159	7,940	7,727	7,519	7,316
IRRIGATION, COLORADO	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | COLORADO COUNTY	$178	$178	8,050	8,050	8,050	8,050	8,050	8,050
IRRIGATION, COLORADO	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$116	$144	15,408	19,410	23,782	27,254	29,836	32,422
IRRIGATION, COLORADO	K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$60	N/A	13,047	6,045	2,659	0	0	0
IRRIGATION, GILLESPIE	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$643	$643	28	28	28	28	28	28
IRRIGATION, MATAGORDA	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$11	$11	8,294	8,311	8,336	8,371	8,418	8,479
IRRIGATION, MATAGORDA	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | GULF COAST AQUIFER SYSTEM FRESH/BRACKISH | MATAGORDA COUNTY	$180	$180	510	510	510	510	510	510
IRRIGATION, MATAGORDA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	8,480	8,251	8,030	7,813	7,603	7,400
IRRIGATION, MATAGORDA	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | MATAGORDA COUNTY	$430	$430	300	300	300	300	300	300
IRRIGATION, MATAGORDA	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$128	$161	13,254	18,765	24,505	29,691	34,316	38,944
IRRIGATION, MATAGORDA	K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$60	N/A	24,695	8,866	5,026	0	0	0
IRRIGATION, MILLS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	149	145	141	137	134	130
IRRIGATION, MILLS	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | MILLS COUNTY	$403	$403	300	300	300	300	300	300
IRRIGATION, MILLS	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$534	$534	459	459	459	459	459	459
IRRIGATION, SAN SABA	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$382	$382	626	626	626	626	626	626
IRRIGATION, WHARTON*	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$11	$11	5,055	4,958	4,862	4,765	4,663	4,562
IRRIGATION, WHARTON*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	17,139	16,678	16,229	15,793	15,369	14,955
IRRIGATION, WHARTON*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | WHARTON COUNTY	$174	$174	5,600	5,600	5,600	5,600	5,600	5,600
IRRIGATION, WHARTON*	K	IRRIGATION CONSERVATION	DEMAND REDUCTION	$117	$140	20,813	26,472	32,462	37,643	42,009	46,381

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
IRRIGATION, WHARTON*	K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$60	N/A	25,753	10,886	5,420	0	0	0
JOHNSON CITY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	64	77	84	87	90	91
JOHNSON CITY	K	EXPANDED USE OF LOCAL GROUNDWATER	K | ELLENBURGER-SAN SABA AQUIFER | BLANCO COUNTY	N/A	$70	0	100	100	100	100	100
JOHNSON CITY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$3255	$3255	31	28	25	23	23	23
JONESTOWN WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	124	132	141	150	158	165
JONESTOWN WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$3825	$3825	56	47	41	39	40	41
KELLY LANE WCID 1	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	73	66	66	66	66	66
KELLY LANE WCID 1	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1353	$1353	29	52	48	47	46	46
KEMPNER WSC*	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	$0	$0	213	230	237	252	254	257
KEMPNER WSC*	G	MUNICIPAL WATER CONSERVATION - KEMPNER WSC	DEMAND REDUCTION	N/A	$560	0	11	11	11	12	13
KEMPNER WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	32	35	39	42	45	49
KEMPNER WSC*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$3635	$3635	12	12	11	11	12	12
KINGSLAND WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	48	55	54	51	56	61
LA GRANGE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	174	196	213	226	237	245
LA GRANGE	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2835	$2835	86	82	69	63	64	66
LAGO VISTA	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$140	0	224	336	448	560	673
LAGO VISTA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	340	362	373	384	408	446
LAGO VISTA	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$697	$697	168	375	622	914	1,098	1,198
LAKEWAY MUD	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$306	0	450	450	900	900	900
LAKEWAY MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	502	478	454	430	409	409
LAKEWAY MUD	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$588	$588	248	492	748	1,015	1,169	1,168
LEANDER*	G	BRUSHY CREEK RUA-EXISTING CONTRACTS	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$1128	$645	2,967	4,136	4,588	2,891	2,368	1,988
LEANDER*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	320	594	616	645	659	686
LEANDER*	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	1,400	1,400	2,600	2,600	2,600
LEE COUNTY WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	42	43	45	48	58	68
LLANO	K	DIRECT POTABLE REUSE	K | DIRECT POTABLE REUSE	N/A	$3764	0	280	280	280	280	280
LLANO	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	337	296	221	144	150	171
LLANO	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$931	$931	78	147	208	263	285	295
LLANO	K	NEW WATER PURCHASE - LLANO	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$45619	N/A	177	0	0	0	0	0
LOOP 360 WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	223	209	196	183	170	161
LOOP 360 WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$324	$324	110	225	339	450	559	679

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
MANOR	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	161	204	249	302	350	395
MANUFACTURING, FAYETTE	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | YEGUA-JACKSON AQUIFER | FAYETTE COUNTY	N/A	$3960	0	100	100	100	100	100
MANVILLE WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	488	589	687	799	899	993
MANVILLE WSC*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | TRAVIS COUNTY	N/A	$643	0	0	0	0	0	703
MARBLE FALLS	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$296	0	100	200	300	400	500
MARBLE FALLS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	428	567	738	772	759	776
MARBLE FALLS	K	LCRA - EXCESS FLOWS RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$1436	0	4,000	4,000	4,000	4,000	4,000
MARBLE FALLS	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$473	$473	212	567	1,193	1,801	2,387	2,566
MARKHAM MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	5	5	5	5	5	5
MATAGORDA COUNTY WCID 6	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	6	6	6	6	6	6
MATAGORDA WASTE DISPOSAL & WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	23	23	23	24	25	25
MATAGORDA WASTE DISPOSAL & WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$5140	$5140	12	16	13	12	13	13
MEADOWLAKES	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	$0	$0	75	75	75	75	75	75
MEADOWLAKES	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	155	140	126	113	102	92
MEADOWLAKES	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$582	$582	77	145	210	271	326	377
MINING, BASTROP	K	MINING CONSERVATION - BASTROP COUNTY	DEMAND REDUCTION	$16	N/A	2	243	308	233	0	0
MINING, BURNET	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | ELLENBURGER-SAN SABA AQUIFER | BURNET COUNTY	N/A	$534	0	0	0	300	400	700
MINING, BURNET	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | HICKORY AQUIFER | BURNET COUNTY	N/A	$432	0	1,000	1,000	1,000	1,000	1,000
MINING, BURNET	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | MARBLE FALLS AQUIFER | BURNET COUNTY	N/A	$307	0	0	1,000	1,000	1,000	1,000
MINING, BURNET	K	EXPANDED USE OF LOCAL GROUNDWATER	K | ELLENBURGER-SAN SABA AQUIFER | BURNET COUNTY	N/A	$581	0	1,000	1,000	1,000	1,000	1,000
MINING, BURNET	K	MINING CONSERVATION - BURNET COUNTY	DEMAND REDUCTION	$33	$33	1,300	1,300	1,300	1,300	1,300	1,800
MINING, FAYETTE	K	EXPANDED USE OF LOCAL GROUNDWATER	K | YEGUA-JACKSON AQUIFER | FAYETTE COUNTY	$567	N/A	760	760	0	0	0	0
MINING, HAYS	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$1597	0	200	600	600	800	1,000
MINING, HAYS	K	EXPANDED USE OF LOCAL GROUNDWATER	K | TRINITY AQUIFER | HAYS COUNTY	$373	$373	600	600	600	600	600	600
MINING, WILLIAMSON*	G	INDUSTRIAL WATER CONSERVATION	DEMAND REDUCTION	N/A	N/A	0	0	0	0	0	0
NORTH AUSTIN MUD 1	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	43	41	40	40	40	40
NORTH AUSTIN MUD 1	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	770	770	770	770
NORTH SAN SABA WSC	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	34	32	29	25	23	22

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
NORTH SAN SABA WSC	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2030	$2030	17	32	46	60	74	85
NORTHTOWN MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	36	42	47	53	59	63
NORTHTOWN MUD	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	900	1,100	1,300	1,300
OAK SHORES WATER SYSTEM	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	27	28	26	23	21	20
OAK SHORES WATER SYSTEM	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$516	$516	14	29	42	54	65	70
PALACIOS	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	70	55	41	34	33	34
PFLUGERVILLE*	G	MUNICIPAL WATER CONSERVATION - PFLUGERVILLE	DEMAND REDUCTION	N/A	$560	0	598	684	789	888	989
PFLUGERVILLE*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	2,460	3,068	3,748	4,423	5,103	5,103
PFLUGERVILLE*	K	EXPANDED USE OF LOCAL GROUNDWATER	K | EDWARDS-BFZ AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$50	0	0	20	20	20	20
PFLUGERVILLE*	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	0	1,300	3,400	3,400
PFLUGERVILLE*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1607	$1607	563	549	606	674	754	743
POLONIA WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	3	4	4	5	6	8
RICHLAND SUD*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	41	38	35	31	32	33
RICHLAND SUD*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$974	$974	20	39	55	69	70	72
ROLLINGWOOD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	70	63	57	52	47	46
ROLLINGWOOD	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	250	250	250	250
ROLLINGWOOD	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$678	$678	34	64	90	116	142	148
ROUGH HOLLOW IN TRAVIS COUNTY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	107	199	179	179	179	179
ROUGH HOLLOW IN TRAVIS COUNTY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$750	$750	53	220	319	319	319	319
ROUND ROCK*	G	ADDITIONAL ADVANCED CONSERVATION - ROUND ROCK	DEMAND REDUCTION	N/A	$474	0	0	10	24	40	59
ROUND ROCK*	G	BRA SYSTEM OPERATIONS-LITTLE RIVER	G | BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE/RESERVOIR SYSTEM	N/A	$0	0	1	3	14	15	17
ROUND ROCK*	G	BRUSHY CREEK RUA-EXISTING CONTRACTS	K | HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	$976	$976	265	244	219	203	186	170
ROUND ROCK*	G	MUNICIPAL WATER CONSERVATION - ROUND ROCK	DEMAND REDUCTION	N/A	$560	0	25	48	53	57	62
ROUND ROCK*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	68	79	88	99	109	118
ROUND ROCK*	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1489	N/A	6	1	0	0	0	0
SAN SABA	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	214	202	182	162	149	137
SAN SABA	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$623	$623	106	208	300	378	469	556
SCHULENBURG	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	128	131	128	130	136	141

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
SCHULENBURG	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$828	$828	63	128	199	235	246	254
SENNA HILLS MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	76	82	84	83	80	77
SENNA HILLS MUD	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$365	$365	38	85	142	200	258	321
SHADY HOLLOW MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	144	137	137	137	137	137
SHADY HOLLOW MUD	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1402	$1402	71	90	74	65	64	64
SMITHVILLE	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | YEGUA-JACKSON AQUIFER | FAYETTE COUNTY	N/A	$1887	0	700	700	700	700	700
SMITHVILLE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	150	198	259	343	456	606
SMITHVILLE	K	LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	G | BRAZOS RUN-OF-RIVER	N/A	$145	0	0	0	0	0	700
SMITHVILLE	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1736	$1736	69	59	54	59	75	97
STEAM ELECTRIC POWER, BASTROP	K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	DEMAND REDUCTION	$262	$262	55	64	73	82	82	82
STEAM ELECTRIC POWER, FAYETTE	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$145	$145	4,300	4,300	4,300	4,300	4,300	4,300
STEAM ELECTRIC POWER, FAYETTE	K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	DEMAND REDUCTION	$262	$262	480	560	640	720	720	720
STEAM ELECTRIC POWER, LLANO	K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	DEMAND REDUCTION	$262	$262	66	77	88	99	99	99
STEAM ELECTRIC POWER, MATAGORDA	K	AUSTIN RETURN FLOWS	K | COLORADO INDIRECT REUSE	$114	$123	10,696	12,076	12,030	11,984	11,937	11,891
STEAM ELECTRIC POWER, MATAGORDA	K	BLEND BRACKISH SURFACE WATER IN STPNOC RESERVOIR	K | GULF OF MEXICO SALINE	$0	$0	3,000	3,000	3,000	3,000	3,000	3,000
STEAM ELECTRIC POWER, MATAGORDA	K	DOWNSTREAM RETURN FLOWS	K | COLORADO INDIRECT REUSE	N/A	$149	0	3,000	3,000	3,000	3,000	3,000
STEAM ELECTRIC POWER, TRAVIS	K	AUSTIN - CENTRALIZED DIRECT NON-POTABLE REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$995	0	1,750	1,750	1,750	1,750	1,750
SUNSET VALLEY	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | TRINITY AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$2063	0	0	300	300	300	300
SUNSET VALLEY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	67	69	72	75	79	82
SUNSET VALLEY	K	EXPANDED USE OF LOCAL GROUNDWATER	K | EDWARDS-BFZ AQUIFER | TRAVIS COUNTY	N/A	$120	0	0	50	50	50	50
SUNSET VALLEY	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	300	300	300	300
SUNSET VALLEY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$369	$369	33	73	123	183	256	343
SUNSET VALLEY	K	RAINWATER HARVESTING	K | RAINWATER HARVESTING	N/A	$0	0	2	2	3	3	4
SWEETWATER COMMUNITY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	82	172	172	172	172	172

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
TRAVIS COUNTY MUD 10	K	DEVELOPMENT OF NEW GROUNDWATER SUPPLIES	K | TRINITY AQUIFER FRESH/BRACKISH | TRAVIS COUNTY	N/A	$3830	0	100	100	100	100	100
TRAVIS COUNTY MUD 10	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	17	18	19	20	22	23
TRAVIS COUNTY MUD 10	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$925	$925	7	15	25	27	28	30
TRAVIS COUNTY MUD 14	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	9	10	11	12	13	14
TRAVIS COUNTY MUD 14	K	WATER PURCHASE AMENDMENT - TRAVIS COUNTY MUD 14	K | CARRIZO-WILCOX AQUIFER | BASTROP COUNTY	N/A	$1222	0	0	0	35	35	35
TRAVIS COUNTY MUD 2	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	45	46	48	49	52	56
TRAVIS COUNTY MUD 4	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	341	355	360	364	360	351
TRAVIS COUNTY MUD 4	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$399	$399	135	309	507	731	962	1,198
TRAVIS COUNTY WCID 10	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	796	786	766	748	720	688
TRAVIS COUNTY WCID 10	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	2,300	2,300	2,300	2,300
TRAVIS COUNTY WCID 10	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$389	$389	315	660	1,031	1,440	1,858	2,275
TRAVIS COUNTY WCID 17	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$1410	0	510	510	510	510	510
TRAVIS COUNTY WCID 17	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	2,132	2,076	2,056	1,882	1,791	1,848
TRAVIS COUNTY WCID 17	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$549	$549	843	1,748	2,794	3,658	4,317	4,451
TRAVIS COUNTY WCID 18	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	263	304	342	385	423	458
TRAVIS COUNTY WCID 18	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2129	$2129	75	58	47	43	43	46
TRAVIS COUNTY WCID 19	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	82	74	66	60	54	48
TRAVIS COUNTY WCID 19	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$300	$300	40	79	114	146	176	203
TRAVIS COUNTY WCID 20	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	106	96	86	77	70	63
TRAVIS COUNTY WCID 20	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$400	$400	53	103	149	190	228	263
TRAVIS COUNTY WCID POINT VENTURE	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	46	53	57	62	71	82
TRAVIS COUNTY WCID POINT VENTURE	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	0	0	0	50
TRAVIS COUNTY WCID POINT VENTURE	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$544	$544	23	55	94	146	189	216
WEIMAR	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	91	85	79	76	79	82
WEIMAR	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$849	$849	45	83	122	152	156	161
WELLS BRANCH MUD	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	74	72	70	69	69	69
WELLS BRANCH MUD	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	1,400	1,400	1,400	1,400
WEST END WSC*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	7	7	8	8	9	10

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Region K Recommended Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	K	DIRECT POTABLE REUSE	K | DIRECT POTABLE REUSE	N/A	$2893	0	336	336	336	336	336
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	K	DIRECT REUSE	K | DIRECT NON-POTABLE REUSE	N/A	$121	0	224	224	224	224	224
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	2,038	2,133	2,111	2,215	2,238	2,228
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	K	LCRA - EXCESS FLOWS RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$329	0	2,400	2,400	4,600	4,600	5,500
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$401	$401	1,008	2,279	3,644	5,460	7,360	9,370
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	L	GBRA - MBWSP	L | CARRIZO-WILCOX AQUIFER ASR FRESH/BRACKISH | GONZALES COUNTY	N/A	$2119	0	3,000	3,000	3,000	3,000	3,000
WHARTON	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	306	315	329	343	355	366
WHARTON	K	EXPANDED USE OF LOCAL GROUNDWATER	K | GULF COAST AQUIFER SYSTEM | WHARTON COUNTY	N/A	$272	0	3,000	3,000	3,000	3,000	3,000
WHARTON	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2655	$2655	151	165	133	122	123	126
WHARTON COUNTY WCID 2	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	83	80	78	81	84	87
WHARTON COUNTY WCID 2	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$1318	$1318	41	76	97	96	99	101
WILLIAMSON COUNTY WSID 3*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	20	22	20	19	19	19
WILLIAMSON TRAVIS COUNTIES MUD 1*	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	22	19	18	18	17	17
WINDERMERE UTILITY	K	DROUGHT MANAGEMENT	DEMAND REDUCTION	$66	$66	560	560	560	560	560	560
WINDERMERE UTILITY	K	LCRA - MID BASIN RESERVOIR	K | LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE)	N/A	$145	0	0	400	400	400	400
WINDERMERE UTILITY	K	MUNICIPAL CONSERVATION	DEMAND REDUCTION	$2060	$2060	118	62	29	13	8	7
WINDERMERE UTILITY	K	WATER PURCHASE - WINDERMERE UTILITY	G | CARRIZO-WILCOX AQUIFER | BURLESON COUNTY	N/A	$1167	0	500	500	500	500	500

	2020	2030	2040	2050	2060	2070
REGION K RECOMMENDED WMS SUPPLY TOTAI	281,602	327,134	403,274	446,474	503,635	592,386

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Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
AQUA WSC	YES	2030	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - AQUA WSC	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$9,163,000
AQUA WSC	YES	2020	MUNICIPAL CONSERVATION - AQUA WSC	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$16,162,569
AQUA WSC	YES	2050	NEW SURFACE WATER INFRASTRUCTURE - BASTROP REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; DIVERSION AND CONTROL STRUCTURE; NEW CONTRACT; STORAGE TANK	$132,037,000
AUSTIN	YES	2040	AUSTIN - AQUIFER STORAGE AND RECOVERY	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; PUMP STATION; WATER TREATMENT PLANT EXPANSION	$370,527,000
AUSTIN	YES	2070	AUSTIN - BRACKISH GROUNDWATER DESALINATION	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; STORAGE TANK; EVAPORATIVE POND; PUMP STATION	$167,689,000
AUSTIN	YES	2030	AUSTIN - DECENTRALIZED DIRECT NON-POTABLE REUSE	NEW WATER TREATMENT PLANT; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$5,811,000
AUSTIN	YES	2020	AUSTIN - DIRECT REUSE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; WATER TREATMENT PLANT EXPANSION; STORAGE TANK; NEW WATER TREATMENT PLANT	$286,031,000
AUSTIN	YES	2040	AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; WATER TREATMENT PLANT EXPANSION	$35,839,000
AUSTIN	YES	2030	AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	WATER LOSS CONTROL; DATA GATHERING/MONITORING TECHNOLOGY; DIVERSION AND CONTROL STRUCTURE	$15,211,000
AUSTIN	YES	2070	AUSTIN - OFF-CHANNEL RESERVOIR AND EVAPORATION SUPPRESSION	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL	$334,642,000
AUSTIN	YES	2020	AUSTIN CONSERVATION	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$719,616,000
BARTON CREEK WEST WSC	NO	2020	MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$444,000
BARTON CREEK WSC	NO	2020	MUNICIPAL CONSERVATION - BARTON CREEK WSC	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$956,000
BASTROP	NO	2020	MUNICIPAL CONSERVATION - BASTROP	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$8,306,000
BASTROP	NO	2050	NEW SURFACE WATER INFRASTRUCTURE - BASTROP REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; DIVERSION AND CONTROL STRUCTURE; NEW CONTRACT; STORAGE TANK	$26,407,000
BASTROP COUNTY WCID 2	NO	2050	NEW SURFACE WATER INFRASTRUCTURE - BASTROP REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; DIVERSION AND CONTROL STRUCTURE; NEW CONTRACT; STORAGE TANK	$9,903,000
BERTRAM	NO	2030	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BERTRAM	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$20,829,000
BERTRAM	NO	2020	MUNICIPAL CONSERVATION - BERTRAM	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$868,000
BLANCO	NO	2030	DIRECT REUSE - BLANCO	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$1,110,000
BLANCO	NO	2030	MUNICIPAL CONSERVATION - BLANCO	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,700,238

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
BUDA	YES	2020	BS/EACD EDWARDS / MIDDLE TRINITY ASR - BUDA	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$7,349,000
BUDA	YES	2040	BS/EACD SALINE EDWARDS DESALINATION AND ASR	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$10,332,000
BUDA	YES	2030	DIRECT POTABLE REUSE - BUDA	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$33,503,000
BUDA	YES	2020	MUNICIPAL CONSERVATION - BUDA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$6,871,000
BURNET	YES	2030	BUENA VISTA REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$11,828,829
BURNET	YES	2020	MUNICIPAL CONSERVATION - BURNET	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,107,000
CEDAR PARK	YES	2020	MUNICIPAL CONSERVATION - CEDAR PARK	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$3,932,000
COLUMBUS	NO	2020	MUNICIPAL CONSERVATION - COLUMBUS	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,160,000
COTTONWOOD SHORES	NO	2020	MUNICIPAL CONSERVATION - COTTONWOOD SHORES	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$830,020
COUNTY-OTHER, BASTROP	NO	2020	MUNICIPAL CONSERVATION - BASTROP COUNTY-OTHER	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,150,000
COUNTY-OTHER, BLANCO	NO	2030	BRUSH MANAGEMENT - BLANCO COUNTY	BRUSH CONTROL	$10,522,274
COUNTY-OTHER, BURNET	NO	2030	BUENA VISTA REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$17,057,171
COUNTY-OTHER, BURNET	NO	2030	EAST LAKE BUCHANAN REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$11,925,000
COUNTY-OTHER, BURNET	NO	2030	MARBLE FALLS REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$16,014,200
COUNTY-OTHER, BURNET	NO	2020	MUNICIPAL CONSERVATION - BURNET COUNTY-OTHER	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,746,933
COUNTY-OTHER, COLORADO	NO	2030	EXPANSION OF GULF COAST AQUIFER SUPPLIES - COLORADO COUNTY-OTHER	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$2,003,000
COUNTY-OTHER, FAYETTE	NO	2020	DEVELOPMENT OF NEW SPARTA AQUIFER SUPPLIES - FAYETTE COUNTY-OTHER	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$6,056,000
COUNTY-OTHER, FAYETTE	NO	2030	EXPANSION OF SPARTA AQUIFER SUPPLIES - FAYETTE COUNTY-OTHER	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$2,638,000
COUNTY-OTHER, GILLESPIE	NO	2030	BRUSH MANAGEMENT - GILLESPIE COUNTY	BRUSH CONTROL	$16,708,308
COUNTY-OTHER, HAYS	NO	2030	BRUSH MANAGEMENT - HAYS COUNTY	BRUSH CONTROL	$1,238,209
COUNTY-OTHER, HAYS	NO	2030	BS/EACD EDWARDS / MIDDLE TRINITY ASR - HAYS COUNTY-OTHER	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$5,975,000
COUNTY-OTHER, HAYS	NO	2040	BS/EACD SALINE EDWARDS DESALINATION AND ASR	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$6,332,000

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
COUNTY-OTHER, HAYS	NO	2070	EXPANSION OF TRINITY AQUIFER SUPPLIES - HAYS COUNTY-OTHER	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$2,674,000
COUNTY-OTHER, HAYS	NO	2030	HAYS COUNTY PIPELINE - REGION K PORTION	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION	$7,485,500
COUNTY-OTHER, TRAVIS	NO	2030	BRUSH MANAGEMENT - TRAVIS COUNTY	BRUSH CONTROL	$1,238,209
COUNTY-OTHER, TRAVIS	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY-OTHER (AQUA TEXAS - RIVERCREST)	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,100,000
CREEDMOOR-MAHA WSC	NO	2030	BS/EACD EDWARDS / MIDDLE TRINITY ASR - CREEDMOOR-MAHA WSC	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$5,975,000
CREEDMOOR-MAHA WSC	NO	2020	MUNICIPAL CONSERVATION - CREEDMOOR-MAHA WSC	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$2,445,000
CYPRESS RANCH WCID 1	NO	2020	MUNICIPAL CONSERVATION - CYPRESS RANCH WCID 1	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$494,000
DRIPPING SPRINGS WSC	NO	2030	DIRECT POTABLE REUSE - DRIPPING SPRINGS WSC	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; PUMP STATION; WATER TREATMENT PLANT EXPANSION	$12,119,000
DRIPPING SPRINGS WSC	NO	2030	DIRECT REUSE - DRIPPING SPRINGS WSC	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$1,450,000
DRIPPING SPRINGS WSC	NO	2040	EXPANSION OF TRINITY AQUIFER SUPPLIES - DRIPPING SPRINGS WSC	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$3,507,000
DRIPPING SPRINGS WSC	NO	2020	MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$7,627,247
ELGIN	NO	2060	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - ELGIN	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; STORAGE TANK	$14,774,000
ELGIN	NO	2020	MUNICIPAL CONSERVATION - ELGIN	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$7,130,000
FAYETTE COUNTY WCID MONUMENT HILL	NO	2020	MUNICIPAL CONSERVATION - FAYETTE COUNTY WCID MONUMENT HILL	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$288,000
FLATONIA	NO	2020	MUNICIPAL CONSERVATION - FLATONIA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,106,000
FREDERICKSBURG	NO	2030	DIRECT REUSE - FREDERICKSBURG	PUMP STATION; STORAGE TANK; EVAPORATIVE POND	$10,175,000
FREDERICKSBURG	NO	2020	MUNICIPAL CONSERVATION - FREDERICKSBURG	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$7,476,000
GEORGETOWN	YES	2020	MUNICIPAL CONSERVATION - GEORGETOWN	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$579,000
GOLDTHWAITE	NO	2020	MUNICIPAL CONSERVATION - GOLDTHWAITE	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,229,000
HAYS	NO	2030	BS/EACD EDWARDS / MIDDLE TRINITY ASR - HAYS	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION	$5,673,000
HAYS	NO	2030	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - HAYS	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION	$3,719,000
HAYS	NO	2060	WATER PURCHASE CONTRACTS & AMENDMENTS - HAYS	CONVEYANCE/TRANSMISSION PIPELINE	$213,000

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
HAYS COUNTY WCID 1	NO	2020	MUNICIPAL CONSERVATION - HAYS COUNTY WCID 1	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,815,000
HAYS COUNTY WCID 2	NO	2020	MUNICIPAL CONSERVATION - HAYS COUNTY WCID 2	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,032,000
HORSESHOE BAY	NO	2030	DIRECT REUSE - HORSESHOE BAY	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION	$1,084,000
HORSESHOE BAY	NO	2020	MUNICIPAL CONSERVATION - HORSESHOE BAY	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$6,832,000
HURST CREEK MUD	NO	2020	MUNICIPAL CONSERVATION - HURST CREEK MUD	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,041,000
IRRIGATION, COLORADO	NO	2020	EXPANSION OF GULF COAST AQUIFER SUPPLIES - COLORADO COUNTY IRRIGATION	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$14,680,000
IRRIGATION, COLORADO	NO	2020	IRRIGATION CONSERVATION - ON FARM - COLORADO COUNTY	CONSERVATION - AGRICULTURAL	$16,465,031
IRRIGATION, COLORADO	NO	2020	IRRIGATION CONSERVATION - REAL-TIME USE METERING AND MONITORING - COLORADO COUNTY	CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$9,859,973
IRRIGATION, COLORADO	NO	2020	IRRIGATION CONSERVATION - SPRINKLER - COLORADO COUNTY	CONSERVATION - AGRICULTURAL	$4,671,137
IRRIGATION, COLORADO	NO	2020	IRRIGATION OPERATIONS CONVEYANCE IMPROVEMENTS - COLORADO COUNTY	CANAL LINING; CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$21,711,976
IRRIGATION, GILLESPIE	NO	2020	IRRIGATION CONSERVATION - DRIP IRRIGATION - GILLESPIE COUNTY	CONSERVATION - AGRICULTURAL; CONVEYANCE/TRANSMISSION PIPELINE	$64,000
IRRIGATION, MATAGORDA	NO	2020	DEVELOPMENT OF NEW GULF COAST AQUIFER SUPPLIES - MATAGORDA COUNTY IRRIGATION	MULTIPLE WELLS/WELL FIELD	$1,195,000
IRRIGATION, MATAGORDA	NO	2020	EXPANSION OF GULF COAST AQUIFER SUPPLIES - MATAGORDA COUNTY IRRIGATION	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$1,431,000
IRRIGATION, MATAGORDA	NO	2020	IRRIGATION CONSERVATION - ON FARM - MATAGORDA COUNTY	CONSERVATION - AGRICULTURAL	$14,677,716
IRRIGATION, MATAGORDA	NO	2020	IRRIGATION CONSERVATION - REAL-TIME USE METERING AND MONITORING - MATAGORDA COUNTY	CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$6,154,934
IRRIGATION, MATAGORDA	NO	2020	IRRIGATION CONSERVATION - SPRINKLER - MATAGORDA COUNTY	CONSERVATION - AGRICULTURAL	$2,915,884
IRRIGATION, MATAGORDA	NO	2020	IRRIGATION OPERATIONS CONVEYANCE IMPROVEMENTS - MATAGORDA COUNTY	CANAL LINING; CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$49,254,266
IRRIGATION, MILLS	NO	2020	EXPANSION OF TRINITY AQUIFER SUPPLIES - MILLS COUNTY IRRIGATION	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$1,323,000
IRRIGATION, MILLS	NO	2020	IRRIGATION CONSERVATION - DRIP IRRIGATION - MILLS COUNTY	CONSERVATION - AGRICULTURAL; CONVEYANCE/TRANSMISSION PIPELINE	$857,000
IRRIGATION, SAN SABA	NO	2020	IRRIGATION CONSERVATION - DRIP IRRIGATION - SAN SABA COUNTY	CONSERVATION - AGRICULTURAL; CONVEYANCE/TRANSMISSION PIPELINE	$834,000
IRRIGATION, WHARTON	NO	2020	EXPANSION OF GULF COAST AQUIFER SUPPLIES - WHARTON COUNTY IRRIGATION	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$11,049,000
IRRIGATION, WHARTON	NO	2020	IRRIGATION CONSERVATION - ON FARM - WHARTON COUNTY	CONSERVATION - AGRICULTURAL	$33,010,253
IRRIGATION, WHARTON	NO	2020	IRRIGATION CONSERVATION - REAL-TIME USE METERING AND MONITORING - WHARTON COUNTY	CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$8,954,093
IRRIGATION, WHARTON	NO	2020	IRRIGATION CONSERVATION - SPRINKLER - WHARTON COUNTY	CONSERVATION - AGRICULTURAL	$4,241,979
IRRIGATION, WHARTON	NO	2020	IRRIGATION OPERATIONS CONVEYANCE IMPROVEMENTS - WHARTON COUNTY	CANAL LINING; CONSERVATION - AGRICULTURAL; DATA GATHERING/MONITORING TECHNOLOGY	$30,013,756
JOHNSON CITY	NO	2020	MUNICIPAL CONSERVATION - JOHNSON CITY	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,131,823

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
JONESTOWN WSC	NO	2020	MUNICIPAL CONSERVATION - JONESTOWN WSC	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,502,106
KELLY LANE WCID 1	NO	2020	MUNICIPAL CONSERVATION - KELLY LANE WCID 1	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$681,000
KEMPNER WSC	YES	2020	MUNICIPAL CONSERVATION - KEMPNER WSC	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$519,566
LA GRANGE	NO	2020	MUNICIPAL CONSERVATION - LA GRANGE	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,637,312
LAGO VISTA	NO	2030	DIRECT REUSE - LAGO VISTA	CONVEYANCE/TRANSMISSION PIPELINE; STORAGE TANK	$212,000
LAGO VISTA	NO	2020	MUNICIPAL CONSERVATION - LAGO VISTA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$6,769,000
LAKEWAY MUD	NO	2030	DIRECT REUSE - LAKEWAY MUD	CONVEYANCE/TRANSMISSION PIPELINE; EVAPORATIVE POND; PUMP STATION; STORAGE TANK	$2,736,000
LAKEWAY MUD	NO	2020	MUNICIPAL CONSERVATION - LAKEWAY MUD	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,588,000
LLANO	NO	2030	DIRECT POTABLE REUSE - LLANO	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$10,415,000
LLANO	NO	2020	MUNICIPAL CONSERVATION - LLANO	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,619,000
LOOP 360 WSC	NO	2020	MUNICIPAL CONSERVATION - LOOP 360 WSC	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$801,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	CONVEYANCE/TRANSMISSION PIPELINE; SINGLE WELL	$331,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	WATER RIGHT/PERMIT LEASE OR PURCHASE	$125,000
LOWER COLORADO RIVER AUTHORITY	YES	2040	LCRA - AQUIFER STORAGE AND RECOVERY	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE; DIVERSION AND CONTROL STRUCTURE	$146,592,000
LOWER COLORADO RIVER AUTHORITY	YES	2040	LCRA - BAYLOR CREEK RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE; WATER RIGHT/PERMIT AMENDMENT NO IBT	$219,883,000
LOWER COLORADO RIVER AUTHORITY	YES	2020	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$74,415,000
LOWER COLORADO RIVER AUTHORITY	YES	2040	LCRA - ENHANCED RECHARGE AND CONJUNCTIVE USE	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE; NEW WATER RIGHT/PERMIT NO IBT; WATER RIGHT/PERMIT AMENDMENT NO IBT	$71,125,000
LOWER COLORADO RIVER AUTHORITY	YES	2020	LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE	$540,110,000

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
LOWER COLORADO RIVER AUTHORITY	YES	2030	LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION; NEW WATER RIGHT/PERMIT EXEMPT IBT; NEW WATER RIGHT/PERMIT NON-EXEMPT IBT	$75,734,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE	$512,792,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	LCRA - PRAIRIE SITE OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; CANAL LINING; DIVERSION AND CONTROL STRUCTURE	$16,690,000
MANUFACTURING, FAYETTE	NO	2030	DEVELOPMENT OF NEW YEGUA-JACKSON AQUIFER SUPPLIES - FAYETTE COUNTY MANUFACTURING	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT	$3,425
MANVILLE WSC	YES	2070	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANVILLE WSC	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$5,035,000
MARBLE FALLS	NO	2030	DIRECT REUSE - MARBLE FALLS	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$1,388,000
MARBLE FALLS	NO	2030	MARBLE FALLS REGIONAL PROJECT	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$40,593,800
MARBLE FALLS	NO	2020	MUNICIPAL CONSERVATION - MARBLE FALLS	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$6,780,000
MATAGORDA WASTE DISPOSAL & WSC	NO	2020	MUNICIPAL CONSERVATION - MATAGORDA WASTE DISPOSAL & WSC	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,030,000
MEADOWLAKES	NO	2020	MUNICIPAL CONSERVATION - MEADOWLAKES	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,706,000
MINING, BURNET	NO	2050	DEVELOPMENT OF NEW ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BURNET COUNTY MINING	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$4,495,000
MINING, BURNET	NO	2030	DEVELOPMENT OF NEW HICKORY AQUIFER SUPPLIES - BURNET COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$4,863,000
MINING, BURNET	NO	2040	DEVELOPMENT OF NEW MARBLE FALLS AQUIFER SUPPLIES - BURNET COUNTY MINING	MULTIPLE WELLS/WELL FIELD	$3,345,000
MINING, BURNET	NO	2030	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BURNET COUNTY MINING	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$7,097,000
MINING, FAYETTE	NO	2020	EXPANSION OF YEGUA-JACKSON AQUIFER SUPPLIES - FAYETTE COUNTY MINING	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$5,463,000
MINING, HAYS	NO	2020	EXPANSION OF TRINITY AQUIFER SUPPLIES - HAYS COUNTY MINING	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$2,409,000
NORTH SAN SABA WSC	NO	2020	MUNICIPAL CONSERVATION - NORTH SAN SABA WSC	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$2,122,000
OAK SHORES WATER SYSTEM	NO	2020	MUNICIPAL CONSERVATION - OAK SHORES WATER SYSTEM	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$237,000
PFLUGERVILLE	YES	2020	MUNICIPAL CONSERVATION - PFLUGERVILLE	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$9,804,939
RICHLAND SUD	NO	2020	MUNICIPAL CONSERVATION - RICHLAND SUD	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$680,000
ROLLINGWOOD	NO	2020	MUNICIPAL CONSERVATION - ROLLINGWOOD	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$822,000

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
ROUGH HOLLOW IN TRAVIS COUNTY	NO	2020	MUNICIPAL CONSERVATION - ROUGH HOLLOW IN TRAVIS COUNTY	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,892,000
ROUND ROCK	YES	2020	MUNICIPAL CONSERVATION - ROUND ROCK	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$69,787
SAN SABA	YES	2020	MUNICIPAL CONSERVATION - SAN SABA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,830,000
SCHULENBURG	NO	2020	MUNICIPAL CONSERVATION - SCHULENBURG	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,794,000
SENNA HILLS MUD	NO	2020	MUNICIPAL CONSERVATION - SENNA HILLS MUD	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$454,000
SHADY HOLLOW MUD	NO	2020	MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,132,000
SMITHVILLE	NO	2030	DEVELOPMENT OF NEW YEGUA-JACKSON AQUIFER SUPPLIES - SMITHVILLE	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; WATER TREATMENT PLANT EXPANSION	$13,421,000
SMITHVILLE	NO	2020	MUNICIPAL CONSERVATION - SMITHVILLE	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,440,741
SMITHVILLE	NO	2030	NEW SURFACE WATER INFRASTRUCTURE - SMITHVILLE	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK; DIVERSION AND CONTROL STRUCTURE; NEW CONTRACT	$10,589,000
STEAM ELECTRIC POWER, MATAGORDA	NO	2030	ALTERNATE CANAL DELIVERY - STPNOC	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION	$18,127,000
SUNSET VALLEY	NO	2040	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - SUNSET VALLEY	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; STORAGE TANK; WATER TREATMENT PLANT EXPANSION	$5,401,000
SUNSET VALLEY	NO	2020	MUNICIPAL CONSERVATION - SUNSET VALLEY	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$556,000
TRAVIS COUNTY MUD 10	NO	2030	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - TRAVIS COUNTY MUD 10	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$3,719,000
TRAVIS COUNTY MUD 10	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD 10	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$261,000
TRAVIS COUNTY MUD 4	YES	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD 4	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$2,740,000
TRAVIS COUNTY WCID 10	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 10	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,498,000
TRAVIS COUNTY WCID 17	NO	2030	DIRECT REUSE - TRAVIS COUNTY WCID 17	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$9,030,000
TRAVIS COUNTY WCID 17	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 17	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$16,270,000
TRAVIS COUNTY WCID 18	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 18	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,524,479

Region K Recommended Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
TRAVIS COUNTY WCID 19	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 19	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$187,000
TRAVIS COUNTY WCID 20	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 20	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$582,000
TRAVIS COUNTY WCID POINT VENTURE	NO	2020	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID POINT VENTURE	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$757,000
WEIMAR	NO	2020	MUNICIPAL CONSERVATION - WEIMAR	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$1,203,000
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	YES	2030	DIRECT POTABLE REUSE - WEST TRAVIS COUNTY PUA	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION	$7,788,000
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	YES	2030	DIRECT REUSE - WEST TRAVIS COUNTY PUA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK	$207,000
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	YES	2030	HAYS COUNTY PIPELINE - REGION K PORTION	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION	$22,456,500
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	YES	2020	MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$18,416,000
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	YES	2030	SURFACE WATER INFRASTRUCTURE EXPANSION - WTCPUA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; SURFACE WATER INTAKE MODIFICATION	$35,402,000
WHARTON	NO	2030	EXPANSION OF GULF COAST AQUIFER SUPPLIES - WHARTON	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD	$6,354,000
WHARTON	NO	2020	MUNICIPAL CONSERVATION - WHARTON	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL	$4,681,000
WHARTON COUNTY WCID 2	NO	2020	MUNICIPAL CONSERVATION - WHARTON COUNTY WCID 2	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$1,345,000
WINDERMERE UTILITY	NO	2020	MUNICIPAL CONSERVATION - WINDERMERE UTILITY	CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); DATA GATHERING/MONITORING TECHNOLOGY; WATER LOSS CONTROL	$2,259,450

REGION K RECOMMENDED CAPITAL COST TOTAI	**$4,681,845,633**

Region K Alternative Water User Group (WUG) Water Management Strategies (WMS)

						WATER MANAGEMENT STRATEGY SUPPLY (ACRE-FEET PER YEAR)					
WUG ENTITY NAME	WMS SPONSOR REGION	WMS NAME	SOURCE NAME	UNIT COST 2020	UNIT COST 2070	2020	2030	2040	2050	2060	2070
AQUA WSC*	K	EXPANSION LOCAL USE OF GROUNDWATER - CARRIZO-WILCOX AQUIFER - ALTERNATIVE VERSION	K | CARRIZO-WILCOX AQUIFER | BASTROP COUNTY	N/A	$123	0	5,500	5,500	5,500	13,385	19,121
ROUND ROCK*	G	TRINITY - WILLIAMSON COUNTY ASR	G | TRINITY AQUIFER ASR | WILLIAMSON COUNTY	N/A	$368	0	0	0	0	69	63
REGION K ALTERNATIVE WMS SUPPLY TOTAL						0	5,500	5,500	5,500	13,454	19,184

*A single asterisk next to a WUG's name denotes that the WUG is split by two or more planning regions.

Region K Alternative Projects Associated with Water Management Strategies

SPONSOR NAME	SPONSOR IS WWP?	ONLINE DECADE	PROJECT NAME	PROJECT DESCRIPTION	CAPITAL COST
AQUA WSC	YES	2030	EXPANSION OF CARRIZO-WILCOX AQUIFER - AQUA WSC ALTERNATIVE	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; PUMP STATION	$37,682,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	EXPANSION OF CARRIZO-WILCOX AQUIFER - LCRA ALTERNATIVE	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; PUMP STATION	$38,139,000
LOWER COLORADO RIVER AUTHORITY	YES	2040	LCRA - BRACKISH GROUNDWATER DESALINATION	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK	$229,006,000
LOWER COLORADO RIVER AUTHORITY	YES	2030	LCRA - SUPPLEMENT BAY AND ESTUARY INFLOWS WITH BRACKISH GROUNDWATER	CONVEYANCE/TRANSMISSION PIPELINE; DIVERSION AND CONTROL STRUCTURE; MULTIPLE WELLS/WELL FIELD	$47,269,000

REGION K ALTERNATIVE CAPITAL COST TOTA	**$352,096,000**

Region K Major Water Provider (MWP) Water Management Strategy (WMS) Summary

MWPs are entities of significance to a region's water supply as defined by the Regional Water Planning Group (RWPG) and may be a Water User Group (WUG) entity, Wholesale Water Provider (WWP) entity, or both (WUG/WWP).'MWP Retail Customers' denotes recommended WMS supply used by the WUG. 'Transfers Related to Wholesale Customers' denotes a WWP or WUG/WWP selling or transferring recommended WMS supply to another entity. Supply associated with the MWP's wholesale transfers will only display if it is listed as the main seller in the State Water Planning database, even if multiple sellers are involved with the sale o water to WUGs. Unallocated water volumes represent MWP recommended WMS supply not currently allocated to a customer of the MWP.'Total MWP Related WMS Supply' will display if the MWP's WMS is related to more than one WMS supply type (retail, wholesale, and/or unallocated). Associated WMS Projects are listed when the MWP is one of the project's sponsors. Report contains draft data and is subject to change.

AUSTIN | AUSTIN - AQUIFER STORAGE AND RECOVERY						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	7,900	10,500	13,200	15,800
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - AQUIFER STORAGE AND RECOVERY	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; PUMP STATION; WATER TREATMENT PLANT EXPANSION					

AUSTIN | AUSTIN - BLACKWATER AND GREYWATER REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,450	3,450	5,400	7,340	9,290

AUSTIN | AUSTIN - BRACKISH GROUNDWATER DESALINATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	5,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - BRACKISH GROUNDWATER DESALINATION	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; STORAGE TANK; EVAPORATIVE POND; PUMP STATION					

AUSTIN | AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	3,000	3,000	3,000	3,000

AUSTIN | AUSTIN - CENTRALIZED DIRECT NON-POTABLE REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	500	2,990	10,250	14,583	18,917	23,250
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,750	1,750	1,750	1,750	1,750
TOTAL MWP RELATED WMS SUPPLY	500	4,740	12,000	16,333	20,667	25,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - DIRECT REUSE	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; WATER TREATMENT PLANT EXPANSION; STORAGE TANK; NEW WATER TREATMENT PLANT					

AUSTIN | AUSTIN - COMMUNITY-SCALE STORMWATER HARVESTING						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	66	158	184	210	236

AUSTIN | AUSTIN - CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	4,910	14,890	24,870	30,120	35,370	40,620

Region K Major Water Provider (MWP) Water Management Strategy (WMS) Summary

WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION
AUSTIN CONSERVATION	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL

AUSTIN | AUSTIN - DECENTRALIZED DIRECT NON-POTABLE REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	1,400	4,160	8,330	12,510	16,680
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - DECENTRALIZED DIRECT NON-POTABLE REUSE	NEW WATER TREATMENT PLANT; STORAGE TANK; WATER TREATMENT PLANT EXPANSION					

AUSTIN | AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	11,000	14,000	17,000	20,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; WATER TREATMENT PLANT EXPANSION					

AUSTIN | AUSTIN - LAKE AUSTIN OPERATIONS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	2,500	2,500	2,500	2,500	2,500	2,500

AUSTIN | AUSTIN - LONGHORN DAM OPERATION IMPROVEMENTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	3,000	3,000	3,000	3,000	3,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	WATER LOSS CONTROL; DATA GATHERING/MONITORING TECHNOLOGY; DIVERSION AND CONTROL STRUCTURE					

AUSTIN | AUSTIN - OFF-CHANNEL RESERVOIR AND EVAPORATION SUPPRESSION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	0	0	0	0	25,827
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
AUSTIN - OFF-CHANNEL RESERVOIR AND EVAPORATION SUPPRESSION	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; WATER LOSS CONTROL					

AUSTIN | AUSTIN - ONSITE RAINWATER AND STORMWATER HARVESTING						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	790	1,880	2,890	3,890	4,900

AUSTIN | AUSTIN RETURN FLOWS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	23,589	23,466	23,342	23,219	23,095	22,972

AUSTIN | DROUGHT MANAGEMENT	
	WATER VOLUMES (ACRE-FEET PER YEAR)

Region K Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	8,266	9,708	11,281	12,423	13,389	14,666

LOWER COLORADO RIVER AUTHORITY | AUSTIN RETURN FLOWS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	12,600	14,027	14,027	14,027	14,027	14,027
RELATED UNALLOCATED WMS WATER VOLUMES	7,144	15,249	14,560	14,723	12,971	12,510
TOTAL MWP RELATED WMS SUPPLY	19,744	29,276	28,587	28,750	26,998	26,537

LOWER COLORADO RIVER AUTHORITY | DOWNSTREAM RETURN FLOWS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	3,000	3,000	3,000	3,000	4,200
RELATED UNALLOCATED WMS WATER VOLUMES	3,985	1,969	3,072	4,164	5,267	4,067
TOTAL MWP RELATED WMS SUPPLY	3,985	4,969	6,072	7,164	8,267	8,267

LOWER COLORADO RIVER AUTHORITY | LCRA - ACQUIRE ADDITIONAL WATER RIGHTS						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	250	250	250	250	250
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	WATER RIGHT/PERMIT LEASE OR PURCHASE					

LOWER COLORADO RIVER AUTHORITY | LCRA - AQUIFER STORAGE AND RECOVERY						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	0	12,973	12,973	12,973	12,973
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
LCRA - AQUIFER STORAGE AND RECOVERY	CONVEYANCE/TRANSMISSION PIPELINE; INJECTION WELL; MULTIPLE WELLS/WELL FIELD; NEW WATER TREATMENT PLANT; PUMP STATION; STORAGE TANK; NEW SURFACE WATER INTAKE; DIVERSION AND CONTROL STRUCTURE					

LOWER COLORADO RIVER AUTHORITY | LCRA - BAYLOR CREEK RESERVOIR						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	0	18,000	18,000	18,000	18,000
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
LCRA - BAYLOR CREEK RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE; WATER RIGHT/PERMIT AMENDMENT NO IBT					

LOWER COLORADO RIVER AUTHORITY | LCRA - ENHANCED RECHARGE (MAR)						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	0	14,486	14,486	14,486	14,486
WMS RELATED MWP SPONSORED PROJECTS	PROJECT DESCRIPTION					
LCRA - ENHANCED RECHARGE AND CONJUNCTIVE USE	CONVEYANCE/TRANSMISSION PIPELINE; MULTIPLE WELLS/WELL FIELD; NEW SURFACE WATEI INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE; NEW WATER RIGHT/PERMIT NO IBT; WATER RIGHT/PERMIT AMENDMENT NO IBT					

LOWER COLORADO RIVER AUTHORITY | LCRA - EXCESS FLOWS RESERVOIR

Region K Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	10,541	13,797	15,997	15,997	16,897
RELATED UNALLOCATED WMS WATER VOLUMES	0	28,706	25,450	23,250	23,250	22,350
TOTAL MWP RELATED WMS SUPPLY	0	39,247	39,247	39,247	39,247	39,247
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE					

LOWER COLORADO RIVER AUTHORITY | LCRA - EXPAND USE OF GROUNDWATER (CARRIZO-WILCOX AQUIFER)						
DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	30	30	30	30	30
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	CONVEYANCE/TRANSMISSION PIPELINE; SINGLE WELL					

LOWER COLORADO RIVER AUTHORITY | LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY						
DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	0	2,500	7,000	15,000	25,000
RELATED UNALLOCATED WMS WATER VOLUMES	0	5,460	8,420	9,380	6,840	0
TOTAL MWP RELATED WMS SUPPLY	0	5,460	10,920	16,380	21,840	25,000
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
LCRA - IMPORT RETURN FLOWS FROM WILLIAMSON COUNTY	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; WATER TREATMENT PLANT EXPANSION; NEW WATER RIGHT/PERMIT EXEMPT IBT; NEW WATER RIGHT/PERMIT NON-EXEMPT IBT					

LOWER COLORADO RIVER AUTHORITY | LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)						
DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	63,495	25,797	13,105	0	0	0

LOWER COLORADO RIVER AUTHORITY | LCRA - MID BASIN RESERVOIR						
DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
TRANSFERS RELATED TO WHOLESALE CUSTOMERS	0	1,400	8,120	12,020	15,570	17,181
RELATED UNALLOCATED WMS WATER VOLUMES	0	18,600	11,880	7,980	4,430	2,819
TOTAL MWP RELATED WMS SUPPLY	0	20,000	20,000	20,000	20,000	20,000
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; DIVERSION AND CONTROL STRUCTURE					

LOWER COLORADO RIVER AUTHORITY | LCRA - PRAIRIE SITE RESERVOIR						
DATA DESCRIPTION	WATER VOLUMES (ACRE-FEET PER YEAR)					
	2020	2030	2040	2050	2060	2070
RELATED UNALLOCATED WMS WATER VOLUMES	0	19,000	9,500	0	0	0
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
LCRA - PRAIRIE SITE OFF-CHANNEL RESERVOIR	CONVEYANCE/TRANSMISSION PIPELINE; NEW SURFACE WATER INTAKE; PUMP STATION; RESERVOIR CONSTRUCTION; CANAL LINING; DIVERSION AND CONTROL STRUCTURE					

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | DIRECT POTABLE REUSE	
	WATER VOLUMES (ACRE-FEET PER YEAR)

Region K Major Water Provider (MWP) Water Management Strategy (WMS) Summary

DATA DESCRIPTION	2020	2030	2040	2050	2060	2070
MWP RETAIL CUSTOMERS	0	336	336	336	336	336
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
DIRECT POTABLE REUSE - WEST TRAVIS COUNTY PUA	CONVEYANCE/TRANSMISSION PIPELINE; NEW WATER TREATMENT PLANT; PUMP STATION					

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | DIRECT REUSE						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
MWP RETAIL CUSTOMERS	0	224	224	224	224	224
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
DIRECT REUSE - WEST TRAVIS COUNTY PUA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK					

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | DROUGHT MANAGEMENT						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
MWP RETAIL CUSTOMERS	2,038	2,133	2,111	2,215	2,238	2,228

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | GBRA - MBWSP						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
MWP RETAIL CUSTOMERS	0	3,000	3,000	3,000	3,000	3,000
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
HAYS COUNTY PIPELINE - REGION K PORTION	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION					

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | LCRA - EXCESS FLOWS RESERVOIR						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
MWP RETAIL CUSTOMERS	0	2,400	2,400	4,600	4,600	5,500
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
SURFACE WATER INFRASTRUCTURE EXPANSION - WTCPUA	CONVEYANCE/TRANSMISSION PIPELINE; PUMP STATION; STORAGE TANK; SURFACE WATER INTAKE MODIFICATION					

WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY | MUNICIPAL CONSERVATION						
	WATER VOLUMES (ACRE-FEET PER YEAR)					
DATA DESCRIPTION	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
MWP RETAIL CUSTOMERS	1,008	2,279	3,644	5,460	7,360	9,370
WMS RELATED MWP SPONSORED PROJECTS	**PROJECT DESCRIPTION**					
MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DATA GATHERING/MONITORING TECHNOLOGY; CONSERVATION - MUNICIPAL (DOES NOT INCLUDE METER REPLACEMENT OR WATER LOSS); WATER LOSS CONTROL					

APPENDIX 5F

REGION K WATER MANAGEMENT STRATEGIES COMMITTEE MEETING MINUTES

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Oasis Conference Room
April 5, 2018

1. Lauri Gillam called meeting to order at 1:18 p.m.

2. Attendees (20)
   Lauri Gillam – Region K Water Management Strategies Committee Chair, Small Municipalities Rep
   Linda Raschke – Region K, Counties Rep Alternate
   Teresa Lutes – Region K, Municipalities Rep
   John Burke –Region K Chair, Water Utilities Rep
   Ann McElroy – Region K, Environmental Rep
   David Wheelock –Region K, River Authority Rep
   David Lindsay – Region K, Recreation Rep (Alternate)
   Karen Haschke – Region K, Public Rep
   Doug Powell – Region K, Recreation
   David Bradsby – Region K, TPWD Rep
   Lann Bookout – TWDB
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Rebecca Batchelder – LCRA
   Stacey Pandey – LCRA
   Helen Gerlach – Austin Water
   Richard Hoffpauir – Hoffpauir Consulting
   Christianne Castleberry – Castleberry Engineering, Region K Water Utilities Alternate
   Tim Andrzejak – ResEnTech/Flexible Solutions
   Jorge Lopez de Cardenas – ResEnTech/Flexible Solutions
   Cindy Smiley – Smiley Law Firm

3. Public Comments
   a. None.

4. Water Management Strategies Committee
   a. Purpose and role of committee
      i. Review process for identification of potentially feasible water management strategies (WMS) and recommend any changes to the RWPG.
      ii. Review strategies from 2016 Plan and discuss changes for 2021 Plan.
      iii. Brainstorm new strategies to be included in 2021 Plan.
      iv. Review screening process for selection of strategies for further analysis.
      v. Review evaluated strategies and projects for recommended or alternative status.
   b. Timeline
      i. Current – Work with committee and WUGs to identify potentially feasible strategies to meet water needs
      ii. September 2018 – Submit Technical Memorandum

iii. End of 2018 – Submit scope of work to TWDB to evaluate each strategy
iv. 2019 – Complete evaluation of strategies

5. Background
    a. Committee must follow TWDB guidelines for water management strategies (WMS)
    b. Creating WMS is a bottoms-up approach
        i. Local WUGs and Wholesale Water Providers (WWPs) are encouraged to be involved in process by review, input, and creation of plans/strategies

6. Consultant Outreach
    a. In late February, AECOM sent letters and surveys to municipal WUGs. Survey was to identify existing and new supplies/strategies for 2021 RWP. Follow-up reminders were sent on April 3.
        i. As of April 5, 56% WUGs have responded.
    b. Discussion of how to make the public more aware of the request for input on water management strategies.
        i. Suggestion that TWDB could develop a template that RWPGs could add specific details to and submit to local newspapers.
        ii. Concentrate on utilities for public outreach, Central Texas Water Efficiency Network, and creating coordinated standards for water conservation and drought triggers.

7. Region K Process for Identifying Potentially Feasible WMSs
    a. 2016 Cycle
        i. Process
            1. Define groupings or common areas with supply deficiencies.
            2. Develop a comprehensive list of potentially feasible strategies for each area.
            3. Meet with potential suppliers/WUGs for each area to determine current strategies under consideration.
            4. Prepare qualitative rating based on cost, reliability, environmental impact, and political acceptability for the various strategies.
            5. Select one or more additional strategies for each area, if appropriate.
            6. Present proposed shortlist at Public Meeting during Region K Planning Group meeting for modification and/or approval.
        ii. Qualitative screening spreadsheet and rating criteria were presented.

    b. 2021 Cycle
        i. Committee recommended adding a column in the qualitative screening spreadsheet, rating third party socioeconomic impacts, per TWDB guidelines.
        ii. Teresa Lutes motioned to advise the Region K Planning Group to keep the same process as completed in the 2016 cycle, with the exception of now screening for socioeconomic impacts. Lauri Gillam seconded. Committee passed motion.

8. Identification of Public Input Items for Fifth Planning Cycle
    a. At the end of the 2016 cycle and at the beginning of the 2021 cycle, the RWPG accepted public comments to be considered for the 2021 RWP.
    b. See attached handout.
        i. David Wheelock suggested representatives from each commenting group make a presentation.
        ii. Lauri Gillam and Jaime Burke will come up with a proposed plan to schedule when the items will be reviewed during meetings.

9. New / Other Business
    a. Next meeting date will be determined after April 11, 2018, which is the next RWPG meeting.

10. Public Comments
    a. Cindy Smiley asked that since the committee does not have the magnitude of the needs/shortages (though it will be available before September), how will the committee determine strategies?
        i. We will have identified potentially feasible strategies, but strategies may change based on shortages.

11. Lauri Gillam adjourned at 3:04 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Committee Meeting
AECOM, Treaty Oak Conference Room
October 15, 2018

1. Lauri Gillam called meeting to order at 2:08 p.m.

2. Attendees (18)
   Committee Members:
   Lauri Gillam – Region K Water Management Strategies Committee Chair
   Teresa Lutes – Region K, Municipalities Rep
   David Wheelock –Region K, River Authority Rep
   Jennifer Walker – Region K, Environmental Rep
   David Bradsby – Region K, TPWD Rep
   Barbara Johnson – Region K, Industries Rep
   David Lindsay – Region K, Recreation Rep (Alternate)
   Dianne Wheeler – Region K, Public Rep (Alternate)

   Additional Attendees:
   Ann McElroy – Region K, Environmental Rep
   Daniel Berglund – Region K, Small Business Rep
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Lann Bookout – TWDB
   John Q. Barnard IV – TWDB
   Rebecca Batchelder – LCRA
   Stacey Pandey – LCRA
   Helen Gerlach – Austin Water
   Christianne Castleberry – Castleberry Engineering / Region K Water Utilities Rep (Alternate)

3. Public Comments
   a. None.

4. Minutes Approval
   a. Draft of April 5, 2018
      i. David Wheelock proposed to add Lann Bookout to attendee list.
   b. David Wheelock motioned to approve the minutes. Lauri Gillam seconded. Committee passed.

5. Status of Region K Strategy Identification/Evaluation Process
    a. Goal of Meeting: To identify which water management strategies (WMS) from 2016 and which new WMS to include to Scope of Work for 2021 evaluation. TWDB has allocated $319,178 in budget for the 2021 evaluation.
        i. RWPG has already submitted partial scope of work (drought management, conservation, expanded use of local groundwater, City of Austin (COA) return flows). Scope of work remaining budget: $232,178
    b. Jennifer Walker asked for clarification on the strategies process.
        i. RWPG is required to prepare a scope of work for each strategy evaluation they want to perform. This scope of work must be presented for public input and RWPG approval before submitting to TWDB for their approval. Once the scope is approved, strategy evaluation can begin. The committee will then begin looking at qualitative and quantitative analysis for individual WUGs for the applicable strategies. The analysis allows for additional determination of whether a strategy is feasible and should be recommended in the 2021 Plan. Having a goal to have the strategies evaluated by September 2019 will aid in completing the draft plan before the March 2020 deadline.

6. Additional Water Management Strategies for Task 5A Scope of Work
    a. 2016 Planning Cycle Strategies
        i. 2016 Plan General (apply to multiple WUGs) Strategies
            1. **Reuse**. Reuse is to remain in one scoping category, but all types of reuse will be listed in the scope: centralized direct non-potable; decentralized direct non-potable; direct potable; indirect. David Lindsay requested that when the consultant evaluates individual reuse strategies, they are to identify location of discharge and body of water. Committee agreed to recommend to RWPG for inclusion in scope.
            2. **Development of New Groundwater**. David Wheelock noted that a potential updated MAG for the Carrizo-Wilcox may want to be considered when update is complete. Committee agreed to recommend to RWPG for inclusion in scope.
            3. **Aquifer Storage and Recovery**. David Lindsay suggested conducting feasibility studies for aquifers to identify their ability to qualify for ASR. Lann Bookout responded that in the current process of scoping, ASR is a proposed strategy that may or may not be created into a project; feasibility studies are conducted after projects are funded and set into motion. Committee agreed to recommend to RWPG but also separate out 2016 Plan ASR projects into individual scoping items. A separate item for potential new ASR strategies will also be scoped.
            4. **Brackish Groundwater Desalination**. There are currently no known Region K potentially feasible strategies other than LCRA and Austin. Committee agreed to recommend inclusion in scope to RWPG.
            5. **Groundwater Importation**. David Lindsay asked if other Regions were looking at Region K water. The general consensus was that the committee didn't know

specifically, but there is not much groundwater to share. Committee agreed to recommend 2016 Plan strategies to RWPG as separate projects: Groundwater Importation – Carrizo-Wilcox to LCRA System; Groundwater Importation – Hays County Pipeline, Groundwater Importation – HCPUA Pipeline. No new groundwater importation strategies are recommended for inclusion in the scope.

6. **New LCRA Contracts**. Committee agreed to recommend to RWPG to scope as two strategies: New LCRA Contracts and New LCRA Contracts Requiring Infrastructure.
7. **LCRA Contract Amendments**. Committee agreed to recommend to RWPG to scope as two strategies: LCRA Contract Amendments and LCRA Contract Amendments Requiring Infrastructure.
8. **Water Purchase Strategy**. Committee agreed to recommend to RWPG to scope as four strategies: New Water Purchase Strategy, New Water Purchase Strategy Requiring Infrastructure, Water Purchase Amendments, and Water Purchase Amendments Requiring Infrastructure. These strategies would be water purchased from any entity other than LCRA.
9. **Amendment to Existing Water Rights/Permits**. COA requested to be included in SOW. Committee agreed to recommend inclusion in scope to RWPG.
10. **Downstream Return Flows**. Committee agreed to recommend inclusion in scope to RWPG.
11. **East Lake Buchanan Project**. Consultant is to contact Burnet County Commissioner or Judge to verify interest in project. Committee agreed to recommend to RWPG to include in scope if interest is expressed.
12. **Buena Vista Regional Project**. Survey responses from Bertram and Burnet both indicated that they were not interested in the project as part of the 2021 RWP. Committee agreed to recommend to RWPG to scope as a limited update.
13. **Marble Falls Regional Project.** Committee agreed to recommend to RWPG to include in scope.
14. **Brush Management.** David Lindsay asked if the scope could be broadened to include watershed management since the Texas State Soil and Water Conservation Board oversees both programs. Up to 200 acre-feet/year of water can be impounded by ranchers without a permit, which is becoming a concern for downstream inflows as large ranches subdivide into smaller properties. Barbara Johnson suggested including discussion of stock ponds and downstream inflows into Chapter 8 (Legislative Recommendations) instead of adding it to the SOW. Committee agreed to recommend to RWPG to scope brush management as a limited update.

ii. 2016 Plan General Strategies that were not Recommended or Alternative

1. **In-Channel Dams in Lower Basin.** Committee agreed not to recommend evaluation of project in 2021 SOW.

2. **Reduced Lake Evaporation.** Committee agreed to recommend inclusion in SOW to RWPG, though it is agreed to be low in importance.
3. **Surface Water Infrastructure Expansion.** Jaime Burke suggested name change to "Water Supply Infrastructure Development or Expansion" in order to be more inclusive. Committee agreed to recommend inclusion in SOW to RWPG.

iii. 2016 Plan Recommended Entity-Specific Strategies – LCRA

1. **LCRA New Off-Channel Reservoir(s)**. Committee agreed to recommend to RWPG to include in SOW as three strategies: LCRA – Mid-Basin Off-Channel Reservoir; LCRA – Prairie Site Off-Channel Reservoir; LCRA – Excess Flows Off-Channel Reservoir.
2. **Amendments to LCRA WMP**. Committee agreed to recommend to RWPG to include in SOW.

iv. 2016 Plan Recommended Entity-Specific Strategies – Matagorda County Steam-Electric

1. **STPNOC Alternate Canal Delivery.** Jason Ludwig requested project remain in SOW. Committee agreed to recommend to RWPG.
2. **STPNOC Brackish Surface Water Blending.** Jason Ludwig requested project remain in SOW. Committee agreed to recommend to RWPG.

v. 2016 Plan Recommended Entity-Specific Strategies – City of Austin

1. **Longhorn Dam Operations Improvements**. Teresa Lutes is to check with COA if there are additional requested improvements. Committee agreed to recommend to RWPG for inclusion in SOW if interest is expressed.
2. **City of Austin Conservation**. COA requested that conservation include lot-scale blackwater reuse, greywater reuse, rainwater harvesting, stormwater harvesting, and AC condensate reuse, among other conservation measures. Committee agreed to recommend to RWPG to include in SOW.
3. **City of Austin Direct Reuse**. COA requested that the scope separate out Centralized Direct Non-Potable Reuse and Decentralized Direct Non-Potable Reuse. Committee agreed to recommend to RWPG to include in SOW.
4. **Capture Local Inflows to Ladybird Lake**. Committee agreed to recommend to RWPG to include in SOW.
5. **Lake Austin Operations.** Committee agreed to recommend to RWPG to include in SOW.
6. **Rainwater Harvesting**. COA requested name change to "Community-Scale Stormwater Harvesting." Scope for stormwater harvesting would be expanded as compared to the 2016 Plan scope for rainwater harvesting. Committee agreed to recommend to RWPG to include in SOW.

vi. 2016 Plan Alternative Entity-Specific Strategies – LCRA

1. **Supplement Bay and Estuary Inflows with Brackish Groundwater Thereby Replacing Demands on LCRA Highland Lake Firm Yield.** David Wheelock requested strategy remain in SOW. Jennifer Walker expressed concerns over the use of brackish water to replace fresh water. Committee agreed to recommend to RWPG to include in SOW.

2. **Baylor Creek Reservoir**. David Wheelock requested strategy remain in SOW because the permit still exists, although there are no current plans to build the reservoir. Committee agreed to recommend to RWPG to include in SOW as a limited update.
3. **City of Leander Return Flows**. David Wheelock requested name change to "Import Return Flows from Williamson County." Committee agreed to recommend to RWPG to include in SOW.
4. **Enhanced Recharge and Conjunctive Use**. David Wheelock requested strategy remain in SOW. Committee agreed to recommend to RWPG to include in SOW.

vii. 2016 Plan Entity-Specific Strategies that were not Recommended or Alternative

1. **City of Goldthwaite Channel Dam**. Committee agreed not to recommend evaluation of project in 2021 SOW.
2. **Move SAR WWTP Discharge Above Austin Gage**. Committee agreed not to recommend evaluation of project in 2021 SOW.
3. **City of Wharton – Water Supply Strategy.** City requested project be included for this planning cycle. Committee agreed to recommend to RWPG to include in SOW.
4. **HB 1437**. In the 2016 Plan, HB 1437 was determined to be more of a funding mechanism rather than a strategy. While it will be associated with funding mechanisms for Irrigation Conservation projects, the committee agreed not to recommend evaluation of this as a strategy in 2021 SOW.

b. Agenda items 6.b., 6.c., 6.d., and 6e. (New Requested Strategies for this Cycle, Issues to Address, Other Strategy Suggestions, and Budget Allocation) are to be considered at next WMS meeting.

7. Action Taken
   a. Lauri Gillam moved to approve strategies to recommend as listed above. Jennifer Walker seconded. Committee passed.

8. New / Other Business
   a. The next RWPG meeting will be October 24, 2018.
   b. The next WMS meeting will be November 30, 2018 at 1:00 p.m. at the AECOM office (9400 Amberglen Blvd, Building E).

9. Lauri Gillam adjourned at 4:06 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
November 30, 2018

1. Lauri Gillam called meeting to order at 1:04 p.m.

2. Attendees (18)
   Committee Members:
   Lauri Gillam – Region K Water Management Strategies Committee Chair
   Barbara Johnson – Region K, Industries Rep
   Daniel Berglund – Region K, Small Business Rep
   David Wheelock –Region K, River Authority Rep
   Doug Powell – Region K, Recreation Rep
   Karen Haschke – Region K, Public Rep
   Teresa Lutes – Region K, Municipalities Rep

   Additional Attendees:
   Ann McElroy – Region K, Environmental Rep
   David Bradsby – Region K, TPWD Rep
   Mike Reagor – Region K, Small Municipalities Rep
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Lann Bookout – TWDB
   Stacey Pandey – LCRA
   Adam Conner – Freese and Nichols
   Blake Neffendorf – City of Buda
   Cindy Smiley – Smiley Law Firm
   Scott Edmonson – City of Llano, Region K Small Municipalities Rep (Alternate)

3. Public Comments
   a. None.

4. Minutes Approval
   a. Draft of October 15, 2018
      i. David Wheelock motioned to approve the minutes. Lauri Gillam seconded. Committee passed.

5. Status of Region K Strategy Identification/Evaluation Process
    a. Goal of Meeting: To identify which new water management strategies (WMS) to add to Scope of Work for 2021 evaluation. TWDB has allocated $319,178 in budget for the 2021 evaluation.
        i. RWPG has already submitted partial scope of work with 48 strategies. Scope of work remaining budget: $46,178.

6. Additional Water Management Strategies for 5A Scope of Work
    a. 2021 Planning Cycle Strategies
        i. New 2021 Planning Cycle Strategies
            1. **Direct Potable Reuse.** Strategy requested by Buda and West Travis County PUA. Buda is conducting an effluent characterization study and hopes to integrate it by 2026 – confirmed by Blake Neffendorf. West Travis County PUA is looking at DPR through Reverse Osmosis treatment. These requests will be considered when evaluating reuse.
            2. **Off-Channel Reservoir.** Strategy requested by City of Austin and Bertram. Bertram is coordinating with TCEQ to determine whether quarry reservoir is sourced by surface water or groundwater. Committee agreed to recommend two separate strategies to RWPG for inclusion in scope.
            3. **Emergency Transfers.** Strategy requested by Hays, Travis County WCID 17, and West Travis County PUA. Hays is looking for emergency transfers from City of Austin and/or City of Buda. Travis County WCID 17 has agreements with Lakeway MUD, Hurst Creek MUD, West Travis County PUA, and the City of Austin. West Travis County PUA requesting an emergency interconnect agreement with City of Austin. Last cycle, emergency interconnects were included under Drought Response (Chapter 7). Committee agreed to consider subject for Chapter 7.
            4. **Oceanwater Desalination.** Strategy requested by LCRA. Committee agreed to recommend to RWPG for inclusion in scope.
            5. **Dredging.** Strategy requested by Llano for local reservoir. Per Mike Reagor, City of Llano previously dredged approximately 273 acre-feet of storage. With recent flooding, all the sediment has re-settled. To increase capacity, Llano also adds a wooden flashboard system along the reservoir; this may require additional engineering to update the system. Committee agreed to recommend to RWPG for inclusion in scope as Reservoir Capacity Expansion, rather than Dredging.
            6. **Infrastructure Construction.** Strategy requested by Lago Vista, Travis County WCID 17, and Wharton. Lago Visa is looking to expand its wastewater treatment to 1.5 MGD and upgrade to produce Type 1 water. Travis County WCID 17 is looking to install irrigation fields in Serena Hills DA as well as storage tanks with pump stations. Wharton is looking at a new treatment plant. These requests will be considered under already scoped strategies, potentially reuse and/or water supply infrastructure development or expansion.
            7. **Pipeline.** Strategy requested by Fredericksburg, West Travis County PUA, and Windermere Utility. Fredericksburg is looking to construct a new pipeline from well field to treatment facility. This request will be considered when evaluating groundwater expansion. West Travis County PUA is looking to build a second raw water line with a raw water pump station expansion. This request will be

considered when evaluating LCRA contract amendment requiring infrastructure, or water supply infrastructure development or expansion. Windermere Utility is requesting the Blue Water/EPCOR 130 interconnect. This request will be considered when evaluating new water purchase strategy requiring infrastructure.

ii. Public Input Items

1. **Irrigation.** Incorporate innovative water management strategies such as drip irrigation and use of brackish groundwater. Request by Central Texas Water Coalition.
   a. Lann Bookout said that Region K could recommend the TWDB irrigation conservation best management practices, but it would not be eligible for funding without a detailed breakdown.
   b. Doug Powell explained that from some viewpoints, it is perceived that the agriculture community does not implement conservation because there are not standards set by any entity, and there is no concrete reporting of what conservation measures irrigators take. Powell requested that in a future RWPG meeting, Daniel Berglund present a short update of what conservation measures are taken in the rice farming community.
   c. David Wheelock will work with Doug Powell, Daniel Berglund, and Barbara Johnson to evaluate how to approach this request, and whether it should potentially be an additional strategy to scope or added to the evaluation of an already scoped task.
2. **City of Wharton – Water Supply Strategy.** Reevaluate strategy for 2021 plan. Request by City of Wharton. Strategy is already included in previously submitted 5A scope of work.
3. **Decentralized Systems.** Consider evaluating decentralized systems that capture, use and reuse water in place. Request by Hill Country Alliance. Strategy is already included in reuse and conservation and will be considered during evaluation.
4. **LCRA Enhanced Recharge.** Include more detailed discussion on feasibility and legality. Request by Central Texas Water Coalition. Strategy is already included in previously submitted 5A scope of work.
5. **Dredging.** Dredge the Highland Lakes to increase capacity. Request by Joe Don Dockery and Donna Klaeger. Difficulties of dredging – particularly the costs associated with hauling sand – were discussed. There's no long-term availability created. To keep at constant capacity, Lakes Buchanan and Travis would need 750 AF of dredging per year, which is equivalent to 121,000 trucks or 500 trucks per working day. Committee agreed to not recommend to RWPG for inclusion in scope because it is not feasible nor is it sustainable.
6. **Rainwater Harvesting.** Committee agreed to recommend to RWPG for inclusion in scope for WUGs other than Austin.
7. Public input comment for committee to consider **–** Request by Hill Country Alliance: Each WUG should consider alternative supplies such as reuse and rainwater in addition to water conservation before adopting large infrastructure projects to import water long distances.
8. Public input comment for committee to consider – Concern about the Hays County Pipeline from Barbara Hopson, Wimberley resident: According to the

State Plan, Wimberley will not need additional water until 2040 at the earliest, although the Drippings Springs area needs additional water immediately because the City of Dripping Springs continues to approve plats for enormous subdivisions for which there is insufficient water available.

b. Issues to Address
   i. WUGs with Water Need in 2020
      1. The strategies used to meet 2020 needs this cycle are particularly important because strategies and projects given a 2020 decade during this planning cycle should be limited to those projects that can be constructed and delivering water within no more than 12 months from the statutory adoption deadline (January 5, 2022) of the state water plan.
      2. There are WUGs with needs in 2020 after application of drought management and conservation. AECOM will reach out to these WUGs in order to coordinate strategies to meet needs.
         a. AECOM will review the Region K Cutoff Model with respect to the City of Llano water rights and reservoir yield.
      3. Presentation of Lower Basin Irrigation strategies from the 2016 Plan, to determine if any additional types of strategies should be scoped for evaluation. None were suggested at this time.

c. Other Strategy Suggestions
   i. In this cycle, Region K has coordinated with municipal WUGs to determine supplies and strategies. Jaime Burke recommended reaching out to agriculture, particularly those in the rice farming community, in order to coordinate feasible strategies for Irrigation. Daniel Berglund recommended attending the Western Rice Belt Convention in January at El Campo Civic Center. AECOM will follow up with Daniel Berglund.
   ii. Materials provided by Dave Lindsay related to encouragement of strategies to protect the inflows to the river, such as brush removal and the State working with landowners on exempt reservoirs, and irrigation conservation measures were handed out as part of the meeting, but the committee did not have time to address this issue. Discussion will be held at the next committee meeting.

d. Budget Allocation
   i. Teresa Lutes recommends leaving about $25,000 unallocated. Committee generally agreed, if feasible with strategies identified today.

7. Action Taken
   a. Barbara Johnson moved to approve strategies to recommend as listed above. Doug Powell seconded. Committee passed.

8. Open Discussion
   a. None.

9. New / Other Business
    a. The next RWPG meeting will be January 9, 2019 at 10 a.m. at the Dalchau Service Center.
    b. The next WMS meeting will be after the RWPG meeting (date/time/location TBD).

10. Lauri Gillam adjourned at 3:39 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
March 4, 2019

1. Jennifer Walker called meeting to order at 1:07 p.m.

2. Attendees (19)
   Committee Members:
   Jennifer Walker – Region K, Environmental Rep, Interim Water Management Strategies Committee Chair
   Daniel Berglund – Region K, Small Business Rep
   David Wheelock – Region K, River Authority Rep
   Doug Powell – Region K, Recreation Rep
   Karen Haschke – Region K, Public Rep
   Teresa Lutes – Region K, Municipalities Rep
   Mike Reagor – Region K, Small Municipalities Rep
   John Burke – Region K Chair, Water Utilities Rep

   Additional Attendees:
   David Bradsby – Region K, TPWD Rep
   David Lindsay – Region K, Recreation Rep (Alternate)
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Lann Bookout – TWDB
   Rebecca Batchelder – LCRA
   Stacey Pandey – LCRA
   Helen Gerlach – Austin Water
   Cindy Smiley – Smiley Law Firm
   Danny Bulovas – Public - BCL

3. Public Comments
   a. None.

4. Minutes Approval
   a. Draft of November 30, 2018
      i. Daniel Berglund motioned to approve the minutes. David Wheelock seconded. Committee passed.

5. Status of Region K Strategy Identification and Evaluation Process
    a. Identification: Identify water management strategies (WMS) to add to Scope of Work for 2021 evaluation. TWDB has allocated $319,178 in budget for the 2021 evaluation.
        i. RWPG has already submitted scope of work with 52 strategies. Scope of work remaining budget: $25,178.
        ii. Bertram Off-Channel Reservoir Strategy
            1. Scoping approval was tabled at Jan. 9, 2019 Region K meeting because the source of the water was unclear as to whether it was groundwater or surface water
            2. TCEQ has not determined whether the source is surface water or groundwater. City is comfortable with moving forward as a groundwater strategy. RWPG will not need to scope individually because project can be evaluated under the Expand Local Use of Groundwater or Water Supply Infrastructure Development or Expansion strategies.
    b. Evaluation: Define methodologies, define potential specific measures, and identify strategy candidates.
        i. Meeting goal: Provide information to the committee on general strategies and their methodologies from the 2016 Plan. Get input from the committee on any methodology changes for this cycle in order to move forward in the evaluation process.

6. Agricultural Irrigation Conservation
    a. Agricultural Irrigation Conservation (Memorandum - David Wheelock and Stacey Pandey)
        i. Memorandum requests RWPG update agricultural irrigation conservation to accurately represent water savings for 2021 RWP. This will be accomplished by three tasks:
            1. Gather data on improved acreage and develop projections for potential future water saving improvements.
                a. To develop accurate strategy estimates, it must be determined how many acres have already had conservation strategies applied to them (improved acreage), and how many additional acres are available for potential improvements.
                    i. Improvements include: land leveling, underground conveyance (converting canals to pipeline), and multiple inlets.
                b. Potential avenues of data:
                    i. LCRA – Surface water information
                    ii. NRCS – land leveling data
                    iii. GCD – Wharton County survey information

c. Consultant will work with Stacey Pandey to develop a plan to come up with more current estimates of improved acreage and potential water savings projections.

2. Update savings estimates for existing irrigation conservation strategies.
    a. Consultant will work with Daniel Berglund to update LEPA (low energy precision application) center pivot sprinkler irrigation.
3. Identify new irrigation conservation strategies and develop updated savings estimates.
    a. Daniel Berglund requested to add on-farm real-time conveyance and delivery metering/monitoring with SCADA at the point of delivery. More real-time flow data would mean more efficient practices.
    b. Discussion of tail water recovery. It is expensive. Will consider for qualitative analysis before ruling out for evaluation.

b. Conservation-Related Items (Handout - David Lindsay)
    i. David Lindsay expressed concern on how to ensure the implementation of strategies.
        1. Jennifer Walker suggested the RWPG add discussion into 2021 RWP to emphasize the responsibility of the individual WUGs to implement strategies. By adding context to the importance of implementation (such as the positive effects of savings, priority or urgency of selected strategies, watershed effects, etc.), it stresses the importance of implementation to municipalities.
        2. Stacey Pandey pointed out that half the battle of grant writing is proving the cost-effectiveness of the strategy. Should the recommended strategies provide a savings to the entity, implementation will already be in consideration.

7. Municipal Conservation
    a. Conservation Strategies for 2021 RWP (Memorandum - AECOM)
        i. Major Water Provider Conservation
            1. LCRA and COA will work with Consultant to ensure data is accurate and updated.
        ii. Municipal Water Conservation
            1. 2016 criteria for municipal water conservation and methodology applied to calculate demand reduction:
                a. 2016 Criteria
                    i. Be a municipal WUG.
                    ii. Have a year 2020 per capita water usage of greater than 140 GPCD, indicating a potential for savings through conservation.

        iii. Conservation was considered, regardless of whether a municipality had needs.
    b. 2016 Methodology
        i. If the 2020 GPCD is greater than 200, apply a 10% GPCD reduction per decade (1% reduction per year) until 200 GPCD is reached. Then apply a 5% GPCD reduction per decade (0.5% reduction per year) until 140 GPCD is reached.
        ii. If the 2020 GPCD is greater than 140, apply a 5% GPCD reduction per decade (0.5% reduction per year) until 140 GPCD is reached.
        iii. If the 2020 GPCD is less than 140, no conservation considered.
        iv. Defer to Water Conservation goals, if applicable.
2. Proposed 2021 methodology applied to calculate demand reduction:
    a. Methodology:
        i. If the 2020 GPCD is greater than 140, apply a 10% GPCD reduction per decade (1% reduction per year) until 140 GPCD is reached.
        ii. If the 2020 GPCD is less than 140, no conservation considered.
        iii. Defer to Water Conservation goals, if applicable.
    b. Concerns:
        i. Doug Powell asked if there may be differences in difficulty of implementing reduction down to 200 than down to 140. Implementation depends on individual demographics of WUGs.
        ii. Small municipalities don't have the same resources to reduce GPCD.
        iii. 1% per year may be overestimating the conservation WUGs are/will actually be doing.
        iv. Karen Haschke asked to what extent are other RWPGs applying demand reduction. Consultant will check and report to committee.
    c. David Wheelock motioned to 1% reduction to reach a 140 GPCD with consideration of individual WUG. Daniel Berglund seconded. Committee passed.
3. Jaime Burke suggested separating conservation projects with capital costs (such as water loss infrastructure) from conservation projects without capital costs, like Region H. Additionally, any project listed in the 2021 RWP with a capital cost for 2020 must be implemented by 2023.

b. Water Conservation by the Yard (Presentation - Jennifer Walker)
    i. Sierra Club, National Wildlife Federation, and Texas Living Waters Project created the report *Water Conservation by the Yard: A Statewide Analysis of Outdoor Water Savings Potential*, which quantifies twice-a-week outdoor watering restrictions.
        1. If a WUG implements such restrictions, it can reduce its demands from 3.5% to 8.5%, depending on the effort employed to implement the measure.
        2. Jennifer Walker requests that savings tables from the implementation of the watering restrictions be added to the 2021 RWP so that individual WUGs would be able to see their savings potential.

8. Drought Management
    a. Drought Management Strategies for 2021 RWP (Memorandum - AECOM)
        i. Drought Management for Municipalities
            1. David Wheelock believes that WUGs will exceed the goal of 15% water demand reduction, as they did during the last drought of record. He suggests the RWPG update demand reduction to 20%.
        ii. Drought Management for Irrigation
            1. The LCRA Water Management Plan states that in a period of drought, no ratoon (second) crop shall be planted. Daniel Berglund noted that water savings numbers from such measures may need reconsideration.

9. Expand Local Use of Groundwater
    a. Expand Local Use of Groundwater Strategy Update for 2021 RWP (Memorandum - AECOM)
        i. Expand Local Use of Groundwater involves pumping additional groundwater from an aquifer that the WUG is currently using as a source, either using the WUG’s existing wells or drilling additional wells. Memorandum details the feasibility and limitations of strategy recommendation.
        ii. Committee decided to table discussion for next WMS meeting in order to receive input from RWPG groundwater representatives.

10. Open Discussion
    a. None.

11. New / Other Business
    a. The next RWPG meeting will be April 24, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.
    b. The next WMS Committee meeting will be April 10, 2019 at 1:00 p.m. at AECOM.

12. Public Comments

a. Cindy Smiley asked that since a standard water use exists for municipal WUGs (GPCD of 140), does the RWPG have one for irrigation WUGs? Smiley recommended adding a reference table to Chapter 5 listing how much water is typically needed to grow a specific crop per acre. A table would assist in better understanding of water requirements for irrigation.
    i. The recommendation will be taken into consideration; Mike Reagor added that water requirements for crops depend on external factors such as weather, climate, soil type, etc., so the water needed is a range.

13. Jennifer Walker adjourned at 4:00 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
April 10, 2019

1. Lauri Gillam called meeting to order at 1:03 p.m.

2. Attendees (24)
   Committee Members:
   Lauri Gillam – Region K, Small Municipalities Rep, Water Management Strategies Committee Chair
   David Wheelock – Region K, River Authority Rep
   Karen Haschke – Region K, Public Rep
   Mike Reagor – Region K, Small Municipalities Rep
   David Van Dresar – Region K, Water Districts Rep
   Ann McElroy – Region K, Environmental Rep
   Barbara Johnson – Region K, Industries Rep
   Teresa Lutes – Region K, Municipalities Rep
   Jennifer Walker – Region K, Environmental Rep

   Additional Attendees:
   David Lindsay – Region K, Recreation Rep (Alternate)
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Helen Gerlach – Region K, Municipalities Rep (Alternate)
   Lann Bookout – TWDB
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Rebecca Batchelder – LCRA
   Stacy Pandey – LCRA
   Steve Box – Environmental Stewardship
   Adam Conner – Freese and Nichols
   Jordan Furnans – LRE Water, LLC
   Cindy Smiley – Smiley Law Firm
   Danny Bulovas – Public – BCL
   Tom Harrison – Public
   Richard Golladay – Public

3. Public Comments
   a. Jordan Furnans from LRE Water, LLC is working on a project studying rainfall response for the TWDB. The draft final report is due at end of June, and the final is due at the end of August. RWPG is interested in hearing a summary of the report once it is released for public consumption.

4. Minutes Approval
    a. Draft of March 4, 2019
        i. David Lindsay motioned to approve the minutes. Karen Haschke seconded. Committee passed.

5. Agricultural Irrigation Conservation
    a. Discussion results from March 4, 2019 meeting
        i. Task 1. AECOM will work with Stacy Pandey to develop a plan to gather data on currently improved acreage, including acreage watered with surface water and/or groundwater, and develop projections for potential future water saving improvements.
        ii. Task 2. AECOM will work with both Stacy Pandey and Daniel Berglund to update savings estimates for existing irrigation conservation strategies.
        iii. Task 3. AECOM will work with Daniel Berglund to consider on-farm SCADA as a new strategy. Also discussed tail water recovery and drip irrigation strategies.
        iv. David Lindsay asked about metrics of tracking accurate water use of individual large farms. Since these water users are large – sometimes larger than municipal WUGs – would it be possible to equate a farm to a WUG in the planning process? David Wheelock responds that naming individual landowners could be a privacy concern. Since the group already considers these large water users when creating the irrigation demands in regional water planning process, they are accounted for.
    b. Irrigation Conveyance Improvements
        i. Committee was asked for feedback on measures included in 2016 RWP.
            1. Stacy Pandey said list is comprehensive, although since last plan, all Gulf Coast gates have been automated.
        ii. Nearly 100,000 acre-feet of built-in irrigation demand are canal losses, as determined by the RWPG for this planning cycle.
            1. Since canals are earth-lined, losses occur mainly through seepage and evapotranspiration.
    c. On-Farm Conservation
        i. RWPG can determine planted acreage for both groundwater and surface water sources, but conjunctive use may skew data.
            1. David Van Dresar noted RWPG can acquire definitive water production from each well for groundwater production.
        ii. RWPG needs to determine improved acreage, likely from the NRCS, and factor in Gulf Coast district priorities on land leveling, due to crop rotation activities.
    d. Other Irrigation Strategies
        i. Sprinkler Irrigation – Recommended in 2016 RWP; RWPG wants to update numbers. Lann Bookout added that Texas A&M has reports on efficiencies.
        ii. Drip Irrigation – Not considered in 2016 RWP; rice farmers cannot grow a second crop with drip irrigation. Could possibly be considered for other crops.

        iii. Tail Water Recovery – Not considered in 2016 RWP; potentially negative environmental impacts and cost may prevent further evaluation.
    e. Expectations and Challenges
        i. Obtaining data such as improved acreage may prove to be difficult, and assumptions may have to be made.
        ii. Question about potential use of brackish groundwater.
        iii. Consultant is to create a spreadsheet, listing:
            1. Strategies for qualitative or quantitative analysis;
            2. Extent of update for 2021 RWP cycle;
            3. Data RWPG needs in order to update.

6. Municipal Conservation
    a. Criteria
        i. The following methodology was applied to all municipal WUGs:
            1. If the 2020 GPCD is greater than 140, apply a 10% GPCD reduction per decade until 140 GPCD is reached.
            2. If the 2020 GPCD is less than 140, no conservation considered.
            3. Defer to individual utility Water Conservation Plan goals, if applicable.
    b. Committee discussed concern: For WUGs with a high GPCD (>300), is it realistic to reduce GPCD almost in half by 2070? Larger WUGs and WUGs with higher water use do/should take more aggressive conservation action. Different WUGs that pull from the same source may have different conservation goal levels, and that is okay. Committee agreed to leave conservation numbers as-is.
    c. Barbara Johnson proposed a policy recommendation for a water use agreement, buying and selling water conservation reduction credits, like carbon credits. Stacy Pandey responded that LCRA has a similar system implemented during drought conditions.
    d. Committee recommended sending methodology and numbers to RWPG.

7. Drought Management
    a. Criteria
        i. Unless indicated by the WUG's Drought Contingency Plan (DCP), the following methodology was applied:
            1. If Base GPCD >100, then 20% Reduction Amount Applied
            2. If Base GPCD <100, then 5% Reduction Amount Applied
        ii. Question asked about the use of 100 GPCD as the cutoff, versus 140 GPCD. Cutoff lower than 140 used based on real-world situations. WUGs with GPCDs lower than 140 still have 20% demand reduction drought restrictions.
    b. Teresa Lutes requested adjustments for City of Austin. COA's regular standard of practice is no more than one day a week watering – along with other reduction measures built into day-to-day use – and it may not be possible to reach an additional 20% reduction with already considerable conservation embedded in standard practice.

8. Expanded Local Use of Groundwater

a. Committee reviewed AECOM Memorandum on Expanded Local Use of Groundwater.
   i. In the 2016 RWP, sixteen (16) municipal strategies and eleven (11) non-municipal strategies were selected for Expand Local Use of Groundwater (also called Expansion of Current Groundwater Supplies). Many of these strategies are likely not potentially feasible as recommended strategies because of limited source availability based on the Modeled Available Groundwater (MAG). David Van Dresar recommends discussing MAG Peak Factor.
   ii. Committee requested AECOM return with tables breaking down each strategy for consideration.

9. Open Discussion
   a. Protecting Inflows to the Colorado River
      i. David Lindsay and Steve Box presented the issue of low inflows: Inflows from the watershed into the Highland Lakes have shown a significant declining trend, even though the 2017 Kennedy TWDB Report found that long-term precipitation volumes at all study sites generally indicated a steady to slightly increasing trend over the 1940-2016 study period. The presentation proposed identifying the protection and conservation of inflows as an important water management strategy for the upper and lower basin.
      ii. David Wheelock responded that data in water supply is based on the drought of record; the supply is already determined during times of low inflows. Additionally, some issues highlighted, such as proliferation of noxious brush, and other items affecting the hydrologic response of the watershed, are included in the measured runoff data used for Region K planning, and this data includes the effects over the most recent eight years of the period of record, which is also the drought of record.
      iii. Jennifer Walker recommended to include this topic of discussion in the Policy Committee meetings based on timeline.

10. New / Other Business
    a. None.

11. Next Meeting
    a. The next RWPG meeting will be April 24, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.
    b. The next WMS meeting is TBD.

12. Public Comments
    a. None.

13. Lauri Gillam adjourned at 3:36 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
June 17, 2019

1. Lauri Gillam called meeting to order at 10:11 a.m.

2. Attendees (18)
   Committee Members:
   Lauri Gillam – Region K, Small Municipalities Rep, Water Management Strategies Committee Chair
   Daniel Berglund – Region K, Small Business Rep
   David Wheelock – Region K, River Authority Rep
   Karen Haschke – Region K, Public Rep
   Barbara Johnson – Region K, Industries Rep
   Teresa Lutes – Region K, Municipalities Rep
   Jennifer Walker – Region K, Environmental Rep

   Additional Attendees:
   David Bradsby – Region K, TPWD Rep
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Helen Gerlach – Region K, Municipalities Rep (Alternate)
   Rebecca Batchelder – Region K, River Authority Rep (Alternate)
   Lann Bookout – TWDB
   Alicia Smiley – AECOM
   Kiera Brown – AECOM
   Shelby Eckols – AECOM
   Stacy Pandey – LCRA
   Heather Rose – LCRA
   Danny Bulovas – Public – Lake Travis

3. Public Comments
   a. None.

4. Minutes Approval
   a. Draft of April 10, 2019
      i. David Wheelock requested changes to 5.b.i. and 9.a.ii.
         1. 5.b.i. Delete the sentences *"Canal seepage can be measured, and it was found that the natural clay barrier has a water loss comparable to that of concrete lined canals. Issues with the canals stem from cattle damaging the clay barrier."*

        2. 9.a.ii. Change *"…are already addressed with strategies like Brush Management*" to *"…and other items affecting the hydrologic response of the watershed, are included in the measured runoff data used for Region K planning, and this data includes the effects over the most recent eight years of the period of record, which is also the drought of record."*
    ii. David Wheelock requested update to task listed in 5.e.iii. Consultant is currently working on listed spreadsheet.
    iii. Jennifer Walker requested change to 6.a.i.3.
        1. Change *"Defer to Water Conservation goals, if applicable"* to "*Defer to individual utility Water Conservation Plan goals, if applicable."*
    iv. Teresa Lutes requested change to 7.b.
        1. Clarify to read, *"Teresa Lutes requested adjustments for City of Austin. COA's regular standard of practice is no more than one day a week watering – along with other reduction measures built into day-to-day use – and it may not be possible to reach an additional 20% reduction with already considerable conservation embedded in standard practice."*
    v. Jennifer Walker motioned to approve the minutes with the changes. Lauri Gillam seconded. Committee passed.

5. Municipal Drought Management
    a. Criteria
        i. Unless indicated by the WUG's Drought Contingency Plan (DCP) or requested by the WUG itself, the following methodology was applied:
            1. If Base GPCD >100, then 20% Reduction Amount Applied
            2. If Base GPCD <100, then 5% Reduction Amount Applied
    b. Discussion
        i. Updated public outreach costs from 2016 Plan: $66/ac-ft/year. Consultant is waiting on the TWDB Socioeconomic Impact Analysis of Unmet Needs to determine costs to utilities based on reduced water sold.
        ii. Jennifer Walker asked which WUGs did not follow the basic methodology. Consultant indicated the provided spreadsheet of GPCD Reduction Amount by WUG accounted for individual DCPs under "severe" drought restrictions.

6. Austin Requested Water Management Strategy Evaluations
    a. Aquifer Storage and Recovery (ASR)
        i. Strategy Definition and Cost
            1. ASR stores surplus treated water from the Colorado River in the Carrizo-Wilcox Aquifer.
            2. Online: 2070; Yield: 60,000 ac-ft/yr; Capital Costs: $363,910,000; Annual Cost: $28,461,000; Unit Cost: $474/ac-ft/yr
        ii. Discussion

1. Teresa Lutes requested the startup decade for the strategy be updated from online in 2070 to online in 2040.
2. Danny Bulovas asked how annual costs were determined, and if the listed $28 million annual cost would continue indefinitely.
    a. Consultant clarified the "largest annual cost" was composed of:
        i. Operational costs
        ii. The annualized total project cost (assuming a debt service period of 20 years)
    b. After the end of the period of debt service to repay facility construction costs, the annual cost is composed of only the annual operational cost.
3. Danny Bulovas asked if the $/acre-foot/year was provided for each strategy for comparison purposes. The consultant confirmed that this was correct.
4. Heather Rose asked if the energy pumping costs for both extraction and injection wells were included in the ASR cost estimate. Consultant confirmed that costs were included in the costs provided by the Austin Water Forward plan.
5. David Wheelock asked if the cost of water treatment was included, given that treated water was proposed for injection into the storage aquifer. Wheelock indicated that the provided Cost Summary listed $0 for water treatment. Consultant indicated that O&M costs were taken as a lump sum from the Austin Water Forward Plan and listed as a single line item in the Cost Summary.
    a. Consultant will separate O&M costs by type (e.g. pumping energy, water treatment, pipeline maintenance, etc.) for this strategy and all other Austin strategies.
6. Jennifer Walker indicated that the language provided in the presentation ("Increased pumpage of Colorado run-of-river water maintains SB3 and LCRA WMP environmental flow standards") was not accurate, as these flows are not necessarily continuously present. However, Walker indicated that the language describing environmental flows in the provided strategy write-up text was satisfactory.

b. Off-Channel Reservoir (OCR) and Evaporation Suppressant
    i. Strategy Definition and Cost
        1. Divert surplus Colorado Run-of-River flows to off-channel reservoir and apply biodegradable evaporation suppressant during summer months.
        2. Online: 2070; Yield: 25,000 ac-ft/yr; Capital Costs: $343,937,000; Annual Cost: $32,903,000; Unit Cost: $1,316/ac-ft/yr
    ii. Discussion

1. In 2014, TWDB ran a pilot test of proposed evaporation suppressant by application to Lake Arrowhead in Wichita Falls. The final report suggested that, with an 87 percent statistical level of confidence, the suppressant reduced evaporation.
2. David Wheelock requested that Evaporation Suppression be included in the RWP as its own strategy for any reservoir. Consultant confirmed that a separate scope item for a Reduced Lake Evaporation strategy exists and can be expanded for other reservoirs given a project sponsor.
3. Daniel Berglund proposed solar panel coverage as a potential method for Evaporation Suppression.
4. Daniel Berglund asked why the unit cost ($/AFY) for OCR was greater than the unit cost for ASR. Teresa Lutes clarified that this difference was due to a higher yield for ASR, as compared to OCR. Lutes indicated that the ASR yield (60,000 acre-ft/yr) may need to be adjusted to reflect that, while 60,000 acre-ft/yr could be withdrawn in a single year, the average yield would be lower, assuming extraction over multiple years of drought.
5. Karen Haschke requested to know the location for the wellfields for the ASR strategy and the reservoir for the OCR strategy. Teresa Lutes indicated that the location of these infrastructures was not yet identified.
6. David Wheelock requested that all strategies make clear whether water produced is raw or treated, as the unit cost of untreated water would more often be less expensive.

c. Onsite Rainwater and Stormwater Harvesting
   i. Strategy Definition and Cost
      1. Lot/building-scale capture and storage of roof and other impervious surface runoff.
      2. Online: 2040; Yield (2040): 1,800 ac-ft/yr; Yield (2070): 4,900 ac-ft/yr; Capital Costs: $204,167,000; Annual Cost: $16,393,660; Unit Cost: $3,346/ac-ft/yr
   ii. Discussion
      1. Barbara Johnson asked if developers would be required to implement rainwater and stormwater harvesting. Teresa Lutes indicated that a combination of ordinances and incentives are in development to achieve the desired yields for this strategy. At this phase, ordinance is proposed for developments >250,000 SF.
      2. Teresa Lutes requested the startup decade for strategy be updated from online in 2040 to online in 2030. Lutes indicated that she would provide a 2030 yield to the Consultant.

3. Daniel Berglund asked if rainwater was 100% reliable, given its nature to be inconsistent. Consultant will confirm that rainwater availability is calculated for DOR conditions for consistency with other strategy assumptions.

d. Capture Local Inflows to Lady Bird Lake
   i. Strategy Definition and Cost
      1. Capture available flows through Lady Bird Lake and route to Ullrich water plant intake. Some infrastructure for this strategy would be utilized from the Indirect Potable Reuse (IPR) through Lady Bird Lake strategy. Total capital costs for both strategies are assigned to IPR; total operational costs for both strategies are assigned to Capture Local Inflows.
      2. Online: 2040; Yield: 1,000 ac-ft/yr; Capital Costs: $0; Annual Cost: $6,383,250; Unit Cost: $6,383/ac-ft/yr
   ii. Discussion
      1. City of Austin to provide a sketch of water flow for inclusion in the strategy write-up.
      2. David Wheelock asked why this strategy is separate from Indirect Potable Reuse (IPR). IPR strategy is proposed for use in a drought worse than the drought of record, whereas Capture Local Inflows to Lady Bird Lake would be used in non-drought and drought years.
      3. Jennifer Walker indicated that this strategy could influence environmental flows and that the LCRA may need to supply more water to achieve environmental flows. Walker requested that the strategy write-up be updated to reflect these concerns.

e. Indirect Potable Reuse (IPR) through Lady Bird Lake
   i. Strategy Definition and Cost
      1. Highly treated South Austin Regional (SAR) WWTP effluent is routed to Ullrich water plant intake. Total capital costs for IPR and the Capture Local Inflows through Lady Bird Lake strategies are assigned to IPR; total operational costs for both strategies are assigned Capture Local Inflows. This strategy would only be utilized when combined storage of Lake Buchanan and Travis is below 400,000 ac-ft.
      2. Online: 2040; Yield: 11,000 ac-ft/yr; Capital Costs: $90,405,000; Annual Cost: $6,361,000; Unit Cost: $318/ac-ft/yr
   ii. Discussion
      1. Heather Rose asked if the strategy would cause pollutant accumulation over time, and if annual costs included advanced treatment to address pollutant accrual. Teresa Lutes responded that modeling showed continued dilution and would not impact water quality and the costs

include advanced treatment for removal of pollutants associated with wastewater effluent.

2. Daniel Berglund asked how the IPR treatment system would account for mercury accrual. Teresa Lutes responded that pollutant levels for IPR are a concern that would need to be addressed, but that IPR is only to be used when the total combined storage of Lakes Buchanan and Travis are below 400,000 acre-ft, a condition worse than experienced in the drought of record.

f. Lake Austin Operations
   i. Strategy Description and Costs
      1. Strategy would allow Lake Austin to be operated with a varying level if Lake Travis and Buchanan combined storage falls below 600,000 ac-ft. Local flows would be captured during storm events and stored for use.
      2. Online: 2020; Yield: 2,500 ac-ft/yr; Capital Costs: $0; Annual Cost: $545,000; Unit Cost: $218/ac-ft/yr
   ii. Discussion
      1. No proposed changes.

g. City of Austin Conservation
   i. Strategy Description and Costs
      1. Austin has a more aggressive conservation program than most WUGs and has made significant advances in reducing per capita water use.
      2. Online: 2020; Yield (2020): 4,910 ac-ft/yr; Yield (2070): 40,620 ac-ft/yr; Capital Costs: $514,560,000; Annual Cost: $54,569,000; Unit Cost: $1,343/ac-ft/yr
   ii. Discussion
      1. Stacy Pandey asked if water loss control could be listed separately – either as a separate strategy or a separate line item – from the Conservation strategy. AECOM will coordinate with Austin to see if that information is available.

7. Burnet County Regional Project Strategy Evaluations
   a. Three projects detailed in the 2011 Burnet-Llano County Regional Study were strategies updated for the 2021 RWP:
   b. Buena Vista
      i. Strategy Definition and Costs
         1. Project would use Burnet's existing raw water intake (RWI), water treatment plant (WTP), and 18" transmission main. The RWI, WTP, and pump station would be expanded to serve Burnet and County-Other communities in Burnet County. LCRA contracts or contract amendments would be needed.

2. Project Yield:
    a. Burnet – Online: 2030; Yield (2030): 1,000 ac-ft/yr; Yield (2040): 2,000 ac-ft/yr
    b. Burnet County-Other (Brazos) – Online 2030; Yield (2030): (500 ac-ft/yr); Yield (2040): 1,000 ac-ft/yr
    c. Burnet County-Other (Colorado) – Online: 2030; Yield (2030): 565 ac-ft/yr); Yield (2040): 1,884 ac-ft/yr
3. Capital Costs: $28,886,000; Annual Cost: $5,546,000; Unit Cost: $1,136/ac-ft/yr

ii. Discussion
1. No proposed changes.

c. East Lake Buchanan

i. Strategy Definition and Costs
1. Strategy to provide surface water to portions of County-Other in Burnet County whose current groundwater supplies are unreliable and contaminated with radionuclides. New raw water intake would pump to a regional water treatment plant near Bonanza Beach, along the northeast side of Lake Buchanan. Pump station and transmission mains would deliver water to Council Creek Village and other participants in the area.
2. Project Yield:
    a. Burnet County-Other (Colorado Basin) – Online: 2030; Yield (2030): 498 ac-ft/yr; Yield (2040): 935 ac-ft/yr
3. Capital Costs: $11,925,000; Annual Cost: $1,830,000; Unit Cost: $1,957/ac-ft/yr

ii. Discussion
1. Jennifer Walker asked why no return flows were assumed for this strategy. David Wheelock indicated that TCEQ regulations prohibit discharges into the Highland Lakes.

d. Marble Falls Regional Water System

i. Strategy Description and Cost
1. Strategy to serve growth in Burnet County for Marble Falls and portions of County-Other (Colorado Basin). New raw water intake, pump stations, and water treatment plant upstream of Max Starcke Dam. New transmission mains and new storage tanks to serve future developments.
2. Project Yields:
    a. Marble Falls – Online: 2030; Yield: 4,000 ac-ft/yr
    b. Burnet County-Other (Colorado) – Online: 2030; Yield: 1,578 ac-ft/yr

3. Capital Costs: $56,608,000; Annual Cost: $8,010,000; Unit Cost: $1,436/ac-ft/yr

ii. Discussion

1. Jennifer Walker asked if there are any shared facilities for the strategies covered in the Regional Study like there are for the Capture Local Inflows to Lady Bird Lake/IPR through Lady Bird Lake strategies. Consultant confirmed none are shared.

8. STPNOC Strategy Evaluations

a. Alternate Canal Delivery

i. Strategy Definition and Cost

1. Strategy will allow higher quality water to be pulled from the Colorado River and transported to the STPNOC cooling tower reservoir. Strategy involves construction of pipeline and pump station to transport from existing LCRA irrigation canals to reservoir.
2. Online: 2030; Yield: 12,727 ac-ft/yr; Capital Costs: $18,127,000; Annual Cost: $3,384,000; Unit Cost: $266/ac-ft/yr

ii. Discussion

1. Stacy Pandey recalled a regulatory issue with using the existing pump station for this strategy. Strategies can still be recommended in the Plan if they have legal impediments, but it would be good to note it in the strategy write-up.
2. Jennifer Walker requested that the environmental impacts section be updated to say environmental flows may be impacted as a result of changing the location of the diversion point.

b. Brackish Surface Water Blending

i. Strategy Definition and Cost

1. During an emergency, STPNOC and LCRA will pursue relief from TCEQ to be able to pump brackish surface water to blend in with the existing fresh water in the STPNOC reservoir.
2. Online: 2020; Yield: 3,000 ac-ft/yr; Capital Costs: $0; Annual Cost: $0; Unit Cost: $0/ac-ft/yr

ii. Discussion

1. No proposed changes.

9. Municipal Conservation

a. Progress to-date: WMS Committee and RWPG voted on and approved the following methodology to be applied to all municipal WUGs:

1. If the 2020 GPCD is greater than 140, apply a 10% GPCD reduction per decade until 140 GPCD is reached.
2. If the 2020 GPCD is less than 140, no conservation considered.

3. Defer to individual utility Water Conservation Plan goals, if applicable.

b. Discussion: Costing Assumptions
   i. To obtain more realistic costs for municipal conservation, the methodology for the 2016 RWP cycle was updated. Separated into capital and non-capital costs, the assumptions are as follows:
   ii. Capital Cost Measure Assumptions
      1. Advanced Metering Infrastructure (Smart Meters)
         a. 3 people per household; 100% of households will install smart meters in the next 50 years; Installation of smart meters reduces demand by 5%; Smart meter cost is $270 per meter.
         b. Daniel Berglund requested justification for the 5% demand reduction achieved by smart meters. Jennifer Walker indicated that there are large water savings from early leak detection and behavioral changes because of live tracking.
         c. Stacy Pandey recommended the addition of an online portal to track customer usage, like that used by the LCRA, as a requirement. The LCRA requires customers to use the portal in order to access grants.
      2. Leak Detection and Replacement
         a. 10% of pipeline is replaced (pipe length from TWDB Water Loss Audit (WLA); 80% of the replaced pipeline is 8”, 20% is 12”; Anticipated demand reduction of 3%.
         b. Stacy Pandey recommended including 4” and 6” replacements in the costing, as these size lines are common for smaller WUGs. Jennifer Walker suggested this may be due to the WLA only listing WUGs with >3,300 connections.
         c. The WLA does not cover all municipal WUGs, so the Region K Consultant does not have pipe length for all WUGs with conservation as a recommended strategy.
   iii. Non-Capital Cost Measure Assumptions
      1. Remaining per decade reduction is due to non-capital actions. Non-capital cost measures include implementing standards, incentives, and education and outreach. This assumption was used in the 2016 RWP cycle. Consultant assumed $250/ac-ft saved.
   iv. A breakdown of capital costs using the TWDB costing tool was provided as an example for West Travis County PUA and Johnson City.
      1. David Wheelock requested that the O&M for pipeline replacement be 0%, with a footnote indicating that no additional maintenance costs are incurred by replacement lines that would not already be incurred from the existing line.
      2. Jennifer Walker requested that water loss control (line replacement) and advanced metering infrastructure be listed separately – either as

separate strategies or separate line items – from the Municipal Conservation strategy. Consultant will investigate separating out the costing in separate tables under the same strategy, as the projects are still municipal conservation.

10. New / Other Business
    a. Jennifer Walker requested a strategy status tracking spreadsheet and a timeline of deadlines, particularly those for WUGs to get information to AECOM, to obtain an overall picture of what remains in the planning cycle.
    b. At the July 10 RWPG meeting, Lann Bookout will present on House Bill (HB) 807, new legislation that affects the regional planning process. Barbara Johnson requested information on HB 2486, which forces Houston to sell its water rights to the Brazos River Authority.
    c. David Wheelock asked for status on Chapter 7, and whether a Drought Management Committee will be necessary for this cycle's process. AECOM is currently waiting on Drought Preparedness Council recommendations to be released for incorporation into the Chapter. Once released, one committee meeting may be desired to go over details of Chapter and make any updated recommendations.
    d. Jennifer Walker and David Wheelock asked when the quantitative analysis will be completed for strategies environmental and socioeconomic impacts, and when Joe Trungale will perform modeling. Joe Trungale is currently developing strategy model for evaluating impacts. He will be performing the modeling over the next few months.
    e. Goal is to complete all draft strategies in time for October Region K meeting.

11. Next Meeting
    a. The next RWPG meeting will be July 10, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.
    b. The next WMS meeting will be after RWPG meeting in the beginning of August. Consultant will bring additional strategies for WMS committee to review. Potential strategies may include, but are not limited to, LCRA strategies, expand local use of groundwater, development of new groundwater supplies, and municipal conservation.

12. Public Comments
    a. None.

13. Lauri Gillam adjourned at 1:12 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
August 8, 2019

1. Lauri Gillam called meeting to order at 9:34 a.m.

2. Attendees (20)
   Committee Members:
   Lauri Gillam – Region K, Small Municipalities Rep, Water Management Strategies Committee Chair
   Daniel Berglund – Region K, Small Business Rep
   David Van Dresar – Region K, Water Districts Rep
   David Wheelock – Region K, River Authority Rep
   Doug Powell – Region K, Recreation Rep
   Karen Haschke – Region K, Public Rep
   Mike Reagor – Region K, Small Municipalities Rep
   Teresa Lutes – Region K, Municipalities Rep

   Additional Attendees:
   David Lindsay – Region K, Recreation Rep (Alternative)
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Helen Gerlach – Region K, Municipalities Rep (Alternate)
   Lann Bookout – TWDB
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Kiera Brown – AECOM
   Marisa Flores-Gonzalez – Austin Water
   Joe Trungale – Trungale Engineering
   Richard Hoffpauir – Hoffpauir Consulting
   Heather Rose – LCRA
   Cindy Smiley – Smiley Law Firm

3. Public Comments
   a. None.

4. Status Update on Water Management Strategy Evaluations
   a. 18 strategies under RWPG or committee review
   b. 15 strategies in progress/pending data
   c. 24 strategies not started
   d. Consultant is working to complete strategy evaluation by October 10 Region K RWPG meeting.

e. David Wheelock requests this detailed update either prior to meetings or attached to meeting minutes. Committee requests that consultant sends out strategies as they're completed.

5. Strategy Water Modeling Options
   a. Strategies that may require WAM modeling
      i. LCRA ASR in Carrizo-Wilcox
      ii. Austin Off-Channel Reservoir with Evaporation Suppressant
      iii. Reservoir Capacity Expansion (for Llano and possibly others)
      iv. Austin Return Flows
      v. Austin ASR
      vi. LCRA New Contracts and Contract Amendments
      vii. Amendments to Existing Water Rights/Permits
      viii. LCRA Mid-Basin Off-Channel Reservoir
      ix. LCRA Prairie Site Off-Channel Reservoir
      x. LCRA Excess Flows Off-Channel Reservoir
      xi. Amendments to LCRA Water Management Plan (Interruptible Water)
      xii. Import Return Flows from Williamson County
      xiii. Enhanced Recharge and Conjunctive use
   b. David Lindsay asks if we are using the new LCRA WMP that is waiting on TCEQ approval and Joe Trungale explained we use the 2015 WMP because that's what we got approval for.
   c. WAM Modeling Discussion
      i. Austin has completed extensive modeling for their strategies as part of the Austin Water Forward Plan development. Does RWPG need to do modeling as well with the Region K Cutoff Model for these?
         1. David Wheelock said that Austin modeling needs to comply Region K Cutoff Model specifications. Teresa Lutes agreed, saying RWPG needs to be consistent across strategies.
         2. Richard Hoffpauir, who performed the modeling for Austin's Water Forward Plan, noted that the Cutoff Model assumptions were included, but there are slight differences. For example, Water Forward included snapshots of 2020, 2040, and 2070, while regional water planning is decadal. Different criteria was included for boundary lines, the naturalized flow set, and return flows. Hoffpauir recommended that, for consistency, the RWPG will need to redo Austin modeling.
         3. Teresa Lutes suggested the Water Modeling Committee may need to reconvene to review some of the modeling results.
         4. Lann Bookout mentioned that modeling needs to happen within the next two months, and there may be little time to approach the TWDB with a hydrologic variance request. David Wheelock asked if Austin could provide a proposed modeling methodology to compare with the

approved hydrologic variances. Joe Trungale will coordinate with Austin to input Austin strategies.

ii. Environmental Impacts
   1. TCEQ environmental flow standards are embedded in the modeling.
   2. Lann Bookout confirmed there are no new standards or criteria for regional planning process modeling.
   3. As the TWDB requires numerical quantitative impacts, committee decided to show impacts similar to the 2016 RWP cycle, as either:
      a. Negligible; or
      b. Water diversions to/from river.

iii. Austin Strategies
   1. Committee will review Austin comments at next WMS meeting and approve at October RWPG meeting.
   2. It was noted that environmental impacts will need to remain quantifiable through the editing process.

6. Municipal Conservation
   a. Strategy methodology and costing assumptions were previously presented to both WMS committee and RWPG. WMS committee received first draft of strategy write-up to vote on at next meeting.
      i. Write-up included discussion on potential yields of outdoor watering restrictions.
      ii. Conservation measures included capital and non-capital costs. Capital costs were broken down into Leak Detection and Repair and Advanced Metering Infrastructure. Improvements such as public outreach and enforcement were included in non-capital costs.
      iii. HB 807 goals may be included in Chapter 5 conservation section.

7. ASR Strategy Evaluations
   a. BS/EACD Edwards/Middle Trinity ASR
      i. Strategy Definition and Cost
         1. Water from the Edwards-BFZ aquifer will be pumped, treated, and stored in the Middle Trinity Aquifer for later use.
         2. Project Yield:
            a. Buda – Online: 2020; Yield (2020): 150 ac-ft/yr; Yield (2030): 600 ac-ft/yr
            b. Sunset Valley – Online: 2030; Yield: 100 ac-ft/yr
         3. Project Costs:
            a. Buda – Capital Costs: $9,086,000; Annual Cost: $781,000; Unit Cost: $1,302/ac-ft/yr
            b. Sunset Valley – Capital Costs: $3,825,000; Annual Cost: $449,000; Unit Cost: $4,490/ac-ft/yr

   ii. Mike Reagor asked which Trinity aquifer the strategy is planned for, since the Glen Rose has a high sulfur concentration. Kiera Brown responded that per the 2017 City of Buda ASR Feasibility Study, testing will be completed to determine the appropriate location. The strategy is considered viable until testing proves otherwise.
   iii. David Wheelock expressed concern whether the unit cost for Sunset Valley is prohibitively high. Sunset Valley's needs could be met through other strategies, but as RWPG does not have all information from the WUG. Consultant will reach out to WUG for feedback.
   iv. David Van Dresar requested that an ASR expert come talk to the group for the 2026 planning cycle. Lann Bookout recommended that RWPG reach out to San Antonio Water System (SAWS) for a tour of the H2Oaks ASR facility.
b. BS/EACD Saline Edwards ASR
   i. Strategy Definition and Cost
      1. Water from the Edwards-BFZ aquifer will be pumped, treated, and stored in the Saline Edwards Aquifer for later use. Recovered water will be blended with water directly from the Saline Edwards to increase yield.
      2. Project Yield:
         a. Buda – Online: 2040; Yield: 800 ac-ft/yr
         b. Hays County-Other – Online: 2040; Yield: 500 ac-ft/yr
      3. Project Costs:
         a. Buda – Capital Costs: $17,166,500; Annual Cost: $2,102,100; Unit Cost: $2,629/ac-ft/yr
         b. Hays County-Other – Capital Costs: $10,746,500; Annual Cost: $1,315,900; Unit Cost: $2,629/ac-ft/yr
   ii. Heather Rose asked if RWPG considered including a distillation plant in the strategy. No; information regarding infrastructure for the strategy was obtained from the WUGs.

8. Rainwater Harvesting
   a. Strategy Definition and Cost
      i. Rebates will be provided to private homeowners who construct a rainwater harvesting system on their property to meet a portion of their water needs. Rebates are not assumed to cover the cost of the entire system.
      ii. Project Yield:
         1. Dripping Springs WSC – Online: 2030; Yield (2030): 34 ac-ft/yr; Yield (2070): 81 ac-ft/yr
         2. Hays – Online: 2030; Yield (2030): 3 ac-ft/yr; Yield (2070): 7 ac-ft/yr
         3. Hays County-Other – Online: 2030; Yield (2030): 16 ac-ft/yr; Yield (2070): 50 ac-ft/yr

4. Sunset Valley – Online: 2030; Yield (2030): 2 ac-ft/yr; Yield (2070): 4 ac-ft/yr

iii. Project Costs:

1. Dripping Springs WSC – Capital Costs: $733,000; Annual Cost: $51,600; Unit Cost: $634/ac-ft/yr
2. Hays – Capital Costs: $62,000; Annual Cost: $4,400; Unit Cost: $639/ac-ft/yr
3. Hays County-Other – Capital Costs: $447,000; Annual Cost: $31,400; Unit Cost: $634/ac-ft/yr
4. Sunset Valley – Capital Costs: $225,000; Annual Cost: $15,800; Unit Cost: $4,069/ac-ft/yr

b. Heather Rose suggested write-up change from "some rainwater catchment systems are gravity driven, where pressurized systems are not required" to "some rainwater catchment systems are gravity driven, where pressurized systems may not be required."

c. Heather Rose expressed concern that forecasting implementation would be difficult. Consultant responded that strategy implementation is the responsibility of the individual WUGs. Drippings Springs WSC, Hays, and Sunset Valley all requested Rainwater Harvesting in their Feb. 2018 Strategy survey. Implementation surveys are released in the following planning cycle after strategy is recommended.

d. WMS committee requests that Consultant revisit strategy write-up, including researching a minimum water storage requirement for rebates and potential TWDB funding.

9. Groundwater Strategies

a. David Lindsay asked if water use within the region exceeds recharge rates. David Van Dresar responded that areas that fall under Groundwater Conservation Districts (GCDs) are not presently exceeding recharge rates. Each Groundwater Management Area (GMA) develops Desired Future Conditions (DFCs) that manages groundwater use (and subsequently manages subsidence).

b. Expand Use of Local Groundwater

i. Daniel Berglund noted that regarding irrigation, wells have already been drilled for the 2020 decade due to the large number of wells drilled 2012-2014, so a capital cost in time for the 2020 decade can be justified. He also added that Matagorda County has limited fresh groundwater due to saltwater intrusion, so wells are shallower, and yields are smaller.

ii. Methodology states that if an expand use of groundwater is less than 100 ac-ft/yr of pumping, a new well would not be required. David Van Dresar said that GCDs would be able to tell RWPG if existing wells are at full capacity.

iii. Daniel Berglund added that as more supplies is used on irrigation, there are higher return flows due to saturated soils; this should be included under environmental impacts.

    iv. David Wheelock requested that Consultant develop alternative strategies for entities with groundwater strategies that exceed the Modeled Available Groundwater (MAG).
  c. Development of New Groundwater
    i. Lann Bookout recommended to add a storage tanks to the costing of groundwater strategies, as it is a typical expense.

10. Irrigation Conservation
  a. Tail Water Recovery
    i. Tail water recovery is the capture, storage, and conveyance of a portion of the irrigation field return flows back into the irrigation system.
    ii. New 2021 Strategy. Status: preliminary strategy write-up (in review).
    iii. Daniel Berglund requested a copy of the costing data, as unit costs appear high.
  b. Sprinkler Irrigation
    i. The application of sprinkler irrigation is an alternative to field inundation in rice farming.
    ii. Existing 2016 Strategy. Status: preliminary strategy write-up (in review).
    iii. Strategy Assumed a water savings of 8 inches (0.67 ac-ft/ac) per acre applied, which is a decrease from the 2016 assumption of 12 inches.
    iv. Daniel Berglund requested a copy of the costing data, as unit costs appear low.
  c. Irrigation Operations Conveyance Improvements
    i. Irrigation operations conveyance improvements improve the efficiency of the water delivery canal system.
    ii. Existing 2016 Strategy. Status: preliminary strategy write-up (in progress).
    iii. Daniel Berglund requested that consultant examine NRCS language to determine whether privately-owned canal systems can be added to the strategy and obtain funding.
  d. Real-Time Monitoring
    i. A smart metering program, using a volumetric probe and SCADA, can assess water use in real-time to improve irrigation efficiency.
    ii. New 2021 Strategy. Status: data collection.
  e. Drip Irrigation for Non-Rice Crops
    i. Drip irrigation is the application of micro irrigation to the root zone of non-rice crops through low pressure, low volume devices.
    ii. New 2021 Strategy. Status: Preliminary strategy write-up (in progress).
  f. On-Farm Conservation
    i. Existing 2016 Strategy. Status: data collection.
    ii. Precision Land Leveling
      1. Precision land leveling grades a field to allow a more uniform shallow water depth across the field.

        2. Daniel Berglund noted that once land leveling is completed, water savings stays same, though farmers may perform a cosmetic "dress up" maintenance.
    iii. Multiple Field Inlets
        1. Multiple field inlets at individual cuts or land sections between levees allows for shallow water application and a quick field drain time.
        2. Daniel Berglund added the strategy also allows for improved rainfall management.
    iv. Reduced Levee Intervals
        1. Reducing the contour interval between levees from 0.2 feet to 0.15 feet minimizes the water depth, and therefore water use.
        2. Daniel Berglund recognized that an LCRA savings verification study has shown that reducing contours can result in a similar or increased use of water, but he believes that the study showed such results because the land leveled was leveled completely flat rather than at a slight grade.

11. Reuse
    a. Discussion postponed for next WMS committee meeting.

12. Minutes Approval
    a. Draft of June 17, 2019
        i. Cindy Smiley requested changes to 2., 6.e.i.1., 7.b.i.1., 9.b.ii.2.a., and 10.d.
            1. 2. Change Danny Bulovas's affiliation from "*BCL*" to "*Lake Travis*."
            2. 6.e.i.1. Spell out "*SAR*" to "*South Austin Regional*."
            3. 7.b.i.1. Add abbreviations for "*raw water intake (RWI)*" and "*water treatment plant (WTP)*."
            4. 9.b.ii.2.a. Add abbreviation for "*Water Loss Audit (WLA).*"
            5. 10.d. Delete "*strategies*" so the sentence reads, "*Jennifer Walker and David Wheelock asked when the quantitative analysis will be completed for environmental and socioeconomic impacts, and when Joe Trungale will perform modeling*."
        ii. Teresa Lutes requested changes to 6.b.i.1., 6.b.ii.1., 6.c.ii.1., 6.c.ii.3., 6.d.i.1., and 6.e.ii.2.
            1. 6.b.i.1. Change "*environmental suppressant*" to "*evaporation suppressant*."
            2. 6.b.ii.1. Add "*report*" so the sentence reads, "*The final report suggested that, with an 87 percent statistical level of confidence, the suppressant reduced evaporation.*"
            3. 6.c.ii.1. Change to read, "*Barbara Johnson asked if developers would be required to implement rainwater and stormwater harvesting. Teresa Lutes indicated that a combination of ordinances and incentives are in*

development to achieve the desired yields for this strategy. At this phase, ordinance is proposed for developments >250,000 SF."

4. 6.c.ii.3. Change to read, "*Daniel Berglund asked if rainwater was 100% reliable, given its nature to be inconsistent. Consultant will confirm that rainwater availability is calculated for DOR conditions for consistency with other strategy assumptions*."
5. 6.d.i.1. Change "*surplus*" to "*available*."
6. 6.e.ii.2. Add "*that would need to be address*" so the sentence reads, "*Teresa Lutes responded that pollutant levels for IPR are a concern that would need to be addressed, but that IPR is only to be used when the total combined storage of Lakes Buchanan and Travis are below 400,000 acre-ft, a condition worse than experienced in the drought of record*."

iii. Lauri Gillam motioned to approve the minutes with the changes. Daniel Berglund seconded. Committee passed.

13. New / Other Business
    a. None.

14. Next Meeting
    a. At least two more WMS committee meetings will need to be scheduled to occur before the next RWPG meeting. A Doodle poll will be sent out to determine the best meeting time for the week of September 16, 2019.
    b. The next RWPG meeting will be October 9, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.

15. Public Comments
    a. None.

16. Lauri Gillam adjourned at 12:44 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
September 16, 2019

1. Lauri Gillam called meeting to order at 9:36 a.m.

2. Attendees (23)
   Committee Members:
   Lauri Gillam – Region K, Small Municipalities Rep, Water Management Strategies Committee Chair
   Daniel Berglund – Region K, Small Business Rep
   David Van Dresar – Region K, Water Districts Rep
   David Wheelock – Region K, River Authority Rep
   Mike Reagor – Region K, Small Municipalities Rep
   Teresa Lutes – Region K, Municipalities Rep
   Karen Haschke – Region K, Public Rep
   David Lindsay – Region K, Recreation Rep (Alternate)

   Additional Attendees:
   David Bradsby – Region K, TPWD Rep
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Temple McKinnon – TWDB
   Jaime Burke – AECOM
   Kiera Brown – AECOM
   Helen Gerlach – Austin Water
   Richard Hoffpauir – Hoffpauir Consulting
   Joe Trungale – Trungale Engineering
   Rebecca Batchelder – LCRA
   Stacy Pandey – LCRA
   Leonard Oliver – LCRA
   Jordan Furnans – LRE Water, LLC (representing Goldthwaite)
   Cindy Smiley – Smiley Law Firm
   Daniel Bulovas – Central Texas Water Coalition
   Adam Connor – Freese & Nichols

3. Public Comments
   a. None.

4. Minutes Approval
   a. Draft of August 8, 2019

        i. Daniel Berglund motioned to approve the minutes. David Van Dresar seconded. Committee passed.

5. Status Update on Water Management Strategy Evaluations
    a. 25 strategies under RWPG or committee review.
    b. 24 strategies in progress/pending data.
    c. 11 strategies not started.
    d. Consultant is working to complete strategy evaluation by October 9 Region K RWPG meeting.

6. Goldthwaite Strategy Request
    a. Goldthwaite recently purchased part of an irrigation water right for 1,000 ac-ft/yr with a 1956 priority. Total diversion rights will now be 2,500 ac-ft/yr. 250 ac-ft/yr of reuse is currently included in Goldthwaite's water rights permit; this will be removed in amended permit, as reuse should not be included in ROR diversion rights.
    b. Goldthwaite Requests
        i. Requesting 2021 Plan strategies to reflect the following:
            1. Water Right Permit Amendment
            2. Expanding Goldthwaite's reservoir storage capacity - – still 0 AFY yield during drought of record
            3. Direct Reuse
    c. Discussion
        i. Consultant proposed two options for incorporation into the RWP:
            1. Describe Goldthwaite's plans as a sub-category of existing strategies:
                a. Water Right Permit Amendment
                b. Reservoir Capacity Expansion
                c. Reuse
            2. Create a new strategy specifically for Goldthwaite
            3. Committee agreed to include a subsection about Goldthwaite and refer to the other strategy sections, so no scope of work changes are needed.

7. Draft Strategy Review
    a. First drafts of strategy write-ups were previously presented to WMS committee for BS/EACD Edwards/Middle Trinity ASR, BS/EACD Saline Edwards ASR, Municipal Conservation, and Rainwater Harvesting. Consultant incorporated comments from discussion.
    b. Daniel Berglund motioned to send the strategies as-is to the RWPG for review. David Wheelock seconded. Committee passed.

8. Groundwater Strategies
    a. Expand Use of Local Groundwater

i. Expand Local Use of Groundwater involves pumping additional groundwater from an aquifer that the WUG is currently using as a source, either using the WUG's existing wells or drilling additional wells.
ii. General Discussion
    1. David Lindsay suggested that the groundwater write-ups include total strategy volume by aquifer.
        a. Jaime Burke explained that regional water planning allocates groundwater by aquifer/county/basin divisions, and these totals are included in the write-up for each aquifer.
        b. Can look at adding if it makes sense.
    2. Mike Reagor requested an explanation of the drawdown levels listed in the environmental impacts sections. He asked if all areas will experience a 240 ft drawdown in the Carrizo-Wilcox Aquifer, for example.
        a. David Van Dresar explained that Desired Future Conditions (DFCs) are determined by Groundwater Conservation Districts (GCDs). GCDs hold public meetings, which can be attended to learn more about and provide input on groundwater conservation practices.
        b. Mike Reagor requested that language be included in the "agricultural impacts" section of the groundwater write-ups to indicate potential impacts on agricultural users.
        c. Daniel Berglund said that the GCDs assess the potential for increased drawdown in drought conditions when issuing groundwater permits.
        d. David Wheelock requested that GCD language throughout the groundwater strategies be revised: each groundwater strategy will contribute drawdown, but that individual strategies will not result in the maximum drawdown defined by the GCD.
    3. David Wheelock requested that the following sentence be revised: "There are currently no irrigation WUGs with supplies of irrigation water or livestock water from the Carrizo-Wilcox Aquifer in Region K." Wheelock requested that the applicable county be specified (i.e., "…in Bastrop County in Region K").
    4. David Lindsay asked if the Regional Water Plan includes an overview of aquifer status.
        a. David Van Dresar explained that GCDs provide information for overall aquifer management, but that no chapter in the Regional Water Plan is set aside for this purpose. The GCD websites provide a variety of resources for more information on aquifer management.
    5. Expand Local Use of Groundwater - Carrizo-Wilcox Aquifer Strategy

a. David Wheelock asked what is meant by Aqua WSC being supplied from the “Brazos (to Colorado)” river basin.
    i. Consultant explained that groundwater will be supplied from the Carrizo-Wilcox Aquifer in the Brazos basin to meet needs in the Colorado basin.
b. David Wheelock said that unit cost for Aqua WSC (Bastrop County) seemed high and asked for more information.
    i. The consultant clarifies that Aqua WSC is supplied by Carrizo-Wilcox water from two river basins. To accomplish this, additional infrastructure is required, resulting in a higher cost. Additional infrastructure includes two separate well fields (to pull from each basin), each with a contingency pump, connected by a pipeline.
c. David Wheelock requested that an annual GCD permit fee of $11/AFY be included in the Expanded Use of Carrizo-Wilcox Aquifer (in Bastrop County) costs. He suggested putting it under the “purchase of water” line item. Wheelock requested that the consultant check if other GCDs have permit fees as well.
d. David Wheelock requested that treatment costs for removal of iron and manganese be included in groundwater strategy costs.
    i. David Van Dresar suggested including the capital costs of new treatment facilities only for new development of groundwater for municipal and manufacturing users. For expansion of existing groundwater sources, it can be assumed that treatment facilities already exist and that only the additional cost of treatment need be included. Consultant agreed.
e. David Wheelock requested that the applicable decade be added to the DFCs.

6. Expand Local Use of Groundwater - Ellenburger-San Saba Aquifer
    a. Bertram (Burnet County)
        i. Mike Reagor said that the costs for this strategy seem high. Consultant indicated that the Bertram strategy will include treatment of surface water, given that the groundwater is sourced from an old quarry pit that is open to the atmosphere. This treatment infrastructure increases the cost substantially.
        ii. Lauri Gillam noted that Bertram’s 2070 need is 394 ac-ft/yr, but the strategy amount is for 3000 ac-ft/yr. Gillam asked for an explanation for the excess supply.

Consultant will contact Bertram to request more details on their water resource plans.

7. Expand Local Use of Groundwater - Gulf Coast Aquifer Strategy
    a. David Wheelock indicated on error on the summary sheet: Wharton (Wharton County, Brazos-Colorado Basin) should have a unit cost of $272/ac-ft, not $593/ac-ft. Consultant agreed.
8. Expand Local Use of Groundwater – Carrizo-Wilcox Alternative Strategy
    a. David Wheelock requested that a $11/ac-ft/yr GCD permit fee be added to the costs.
    b. David Wheelock requested that the following sentence be removed from the environmental impacts section: "An additional result of the MAG exceedance is the potential for decreased springflows."

b. Development of New Groundwater
    i. Development of New Groundwater involves drilling wells to pump groundwater from an aquifer that the WUG is currently not using as a source.
    ii. General Discussion
        1. David Lindsay requested that the plan specify whether a strategy was requested by a WUG or proposed by the planning group/consultant. Consultant agreed.
        2. David Lindsay asked for the status of the TWDB Groundwater-Surface Water Interaction Study that is being implemented by LCRA.
            a. Rebecca Batchelder indicated that the initial site test wasn't viable, and that a new site is currently being identified for the study. The study is ongoing.
    iii. Development of New Groundwater - Gulf Coast Aquifer Strategy
        1. Daniel Berglund asked how the yield of 510 ac-ft/yr was determined for the Irrigation/Matagorda County WUG and said that the yield seemed low for agricultural users. Consultant explained that only 510 ac-ft/yr was needed to meet the needs of the WUG.
    iv. Development of New Groundwater – Yegua-Jackson Aquifer Strategy
        1. David Van Dresar requested that the costs be updated to include 20 acres of land acquisition, as that is what is required for this district based on the yield.
        2. David Van Dresar requested that the peaking factor be adjusted to 1 instead of 2, as that is what is applicable for the district, based on the yield.
    v. Development of New Groundwater - Hickory Aquifer Strategy
        1. Mike Reagor said that the yield for the Mining/Burnet County/Colorado Basin WUG (1,000 ac-ft/yr) seemed high. Consultant clarified that the specified yield is available under the MAG, and that the WUG has a need greater than this amount (4,626 ac-ft/yr).

9. Oceanwater Desalination
    a. Strategy Definition and Cost
        i. The proposed desalination process would divert seawater from the Gulf of Mexico near the Matagorda Bay, treat the water using reverse osmosis (RO) filtration, and deliver treated water to industrial users in and around Bay City.
        ii. Currently, the strategy has no sponsor. Without a sponsor, it will be placed under the "Considered, But Not Recommended" section of the plan.
        iii. Online: 2060
        iv. Project Yield: 22,400 ac-ft/yr
        v. Project Costs: Total Project Costs: $575,331,000; Annual Cost: $79,072,000; Unit Cost: $3,530/ac-ft
    b. Discussion
        i. Teresa Lutes provided comments and suggested edits for the strategy. Consultant will review comments and provide for committee approval at the next meeting.
        ii. David Wheelock requested that the following sentence in the agricultural and natural resource impacts section be revised: "While this strategy would be too expensive for agricultural users, it could potentially provide a source of water to lower basin users that would otherwise use water from the Highland Lakes or the Arbuckle Reservoir." Wheelock requested that the strategy be revised to not be specific to LCRA's water management plan, as LCRA isn't necessarily the sponsor for this strategy. Additionally, Wheelock requested that the language, "while this strategy would be too expensive for agricultural users," be removed.

10. Direct Reuse
    a. Blanco
        i. Online: 2030
        ii. Project Yield: 146 ac-ft/yr
        iii. Project Costs: Total Project Costs: $1,529,000; Annual Cost: $132,000; Unit Cost: $904/ac-ft
    b. Horseshoe Bay
        i. Online: 2030
        ii. Project Yield: 154 ac-ft/yr
        iii. Project Costs: Total Project Costs: $1,270,000; Annual Cost: $106,000; Unit Cost: $688/ac-ft
    c. Marble Falls
        i. Online: 2030
        ii. Project Yield: 100 ac-ft/yr (2030); 500 ac-ft/yr (2070)
        iii. Project Costs: Total Project Costs: $2,010,000; Annual Cost: $177,000; Unit Cost: $354/ac-ft
    d. Meadowlakes

   i. Online: 2020
   ii. Project Yield: 75 ac-ft/yr
   iii. Project Costs: Total Project Costs: $0; Annual Cost: $0; Unit Cost: $0/ac-ft

e. Fredericksburg
   i. Online: 2030
   ii. Project Yield: 132 ac-ft/yr
   iii. Project Costs: Total Project Costs: $9,280,000; Annual Cost: $720,000; Unit Cost: $508/ac-ft

f. Buda
   i. Online: 2020
   ii. Project Yield: 100 ac-ft/yr (2020); 1,680 ac-ft/yr (2070)
   iii. Project Costs: Total Project Costs: $7,562,000; Annual Cost: $627,000; Unit Cost: $373/ac-ft

g. Dripping Springs WSC
   i. Online: 2030
   ii. Project Yield: 390 ac-ft/yr (2030); 672 ac-ft/yr (2070)
   iii. Project Costs: Total Project Costs: $2,056,000; Annual Cost: $187,000; Unit Cost: $278/ac-ft

h. West Travis County PUA
   i. Online: 2030
   ii. Project Yield: 224 ac-ft/yr
   iii. Project Costs: Total Project Costs: $1,778,000; Annual Cost: $153,000; Unit Cost: $683/ac-ft

i. Lago Vista
   i. Online: 2030
   ii. Project Yield: 224 ac-ft/yr (2030); 673 ac-ft/yr (2070)
   iii. Project Costs: Total Project Costs: $2,140,000; Annual Cost: $229,000; Unit Cost: $340/ac-ft

j. Lakeway MUD
   i. Online: 2030
   ii. Project Yield: 100 ac-ft/yr (2030); 500 ac-ft/yr (2070)
   iii. Project Costs: Total Project Costs: $2,009,000; Annual Cost: $177,000; Unit Cost: $354/ac-ft

k. Travis County WCID 17
   i. Online: 2030
   ii. Project Yield: 510 ac-ft/yr
   iii. Project Costs: Total Project Costs: $10,737,000; Annual Cost: $867,000; Unit Cost: $1,700/ac-ft

l. General Discussion
   i. David Wheelock requested that the discrepancy between costs calculated with the TWDB's costing tool and those calculated externally (e.g., Travis County WCID 17) be investigated, as they differ by up to $1,400/ac-ft.

ii. Teresa Lutes said that the Austin Reuse Strategy is costed at approximately $1,500/ac-ft.
iii. Stacy Pandey requested that the Horseshoe Bay description be revised. Pandey requested that the entity be referred to as "Horseshoe Bay," not "The Horseshoe Bay Subdivision of Summit Rock."
iv. Stacy Pandey requested the Meadowlakes description be revised. Pandey indicated that the infrastructure has already been constructed and requested that the strategy be updated to indicate this.

11. Downstream Return Flows
    a. Strategy Definition and Cost
        i. This strategy accounts for return flows from Pflugerville that are already returned to the Colorado River. Return flows are calculated as 60 percent of the total demand for Pflugerville, post drought management and conservation savings, and reduced by 10 percent, to account for channel losses and evaporation. The strategy allocates Pflugerville's return flows to LCRA and other downstream users.
        ii. Online: 2020
        iii. Project Yield: 3,985 ac-ft/yr (2020); 8,267 ac-ft/yr (2070)
        iv. Project Costs: No capital costs.
    b. Discussion
        i. Mike Reagor asked why no costs for treatment were included.
            1. Any treatment improvements required to maintain return flow/discharge quality are the responsibility of the wastewater plant, and not the downstream water receiver. The wastewater plant will be required to maintain discharge quality regardless of whether the return flows are utilized as a supply, as this strategy proposes to do.
        ii. David Wheelock requested the following language from the environmental impacts section be removed: "During drought years, return flows will have a higher concentration of nutrients and pollutants due to increased conservation and drought management efforts. Additional treatment may be needed to ensure environmental protection and to ensure quality for use as a water supply." The reasoning for this redaction is as follows: while flows into the wastewater plant may become more concentrated during a drought, discharge requirements will remain the same. Thus, the quality of return flows should be maintained during times of drought. Consultant agreed to remove the language.
        iii. David Wheelock requested that the cost of the additional pumping required to intake the return flows be included.

12. Irrigation Conservation
    a. Tail Water Recovery
        i. Status: draft strategy write-up in review – costing.

b. Sprinkler Irrigation
    i. Status: draft strategy write-up in review – costing.
c. Irrigation Operations Conveyance Improvements
    i. Status: preliminary strategy write-up in progress – coordinating with LCRA.
    ii. Daniel Berglund asked if this strategy applies to privately owned canals.
    iii. Stacy Pandey requested that private canals be discussed in their own section in the On-Farm Conservation write-up.
d. Real-Time Monitoring
    i. Status: data collection.
    ii. Daniel Berglund said that his GCD requires that irrigation, municipal, and manufacturing well owners report their usage annually. Berglund requested that Region K propose (in the policy recommendations section of the plan) that all GCDs require their irrigation, municipal, and manufacturing users to report annual groundwater usage.

e. Drip Irrigation for Non-Rice Crops
    i. Status: Preliminary strategy write-up in progress – water savings.
    ii. Consultant hasn't found verifiable water savings. Some studies show that water consumption may increase after implementing drip irrigation. Continue evaluating strategy?
        1. Daniel Berglund said that drip irrigation in the Gulf Coast Aquifer region is difficult to implement because the soil is highly saturated. Berglund said that water consumption may increase when using drip irrigation because, when farmers save on water expenses, they have more financial resources available to grow additional crops. Berglund requested that the consultant's sources be examined to determine if the acreage is held constant for the studies claiming water consumption increases.
        2. Mike Reagor said that he knows of grape, pecan, and peach farmers who are already implementing drip irrigation.
        3. David Lindsay said that this strategy will likely have high costs, due to high maintenance requirements.
        4. Stacy Pandey requested that the strategy include discussion of specific crops, as opposed to generalizing trends and applications for all non-rice crops. Pandey also requested that the write-up include discussion of why drip irrigation is not feasible for rice crops.
        5. Consultant will consider for Mills County Irrigation.
f. On-Farm Conservation
    i. Status: preliminary strategy write-up in progress.
    ii. Sub-strategies include: Precision Land Leveling, Multiple Field Inlets, Conveyance Improvements, Irrigation Pipeline, Reduced Levee Intervals

1. Daniel Berglund and Stacy Pandey discussed the specifics of Reduced Levee Intervals. Leveling land conserves water by reducing the required volume of water to create the minimum ponding depth. By making levees less steep (reducing the number of elevation steps), land is made more level and water conserved. Because level intervals are related to land leveling, Daniel Berglund and Stacy Pandey requested that Reduced Levee Intervals be included as a subcategory within the Precision Land Leveling Strategy.

13. LCRA Water Management Strategy Evaluations
    a. Notified planning group of the following strategies pending internal review:
        i. LCRA Expand Groundwater in Bastrop County
        ii. LCRA Groundwater for Fayette Power Plant – onsite (smaller yield within MAG)
        iii. LCRA Alternative Groundwater for Fayette Power Plant – onsite (larger yield exceeding MAG)
        iv. LCRA Groundwater for Fayette Power Plant – offsite
        v. LCRA Baylor Creek Reservoir
        vi. Alternative LCRA Supplement Environmental Flows with Brackish Groundwater
    b. No discussion.

14. Water Purchase and Contracts
    a. Notified planning group of assumptions for the following strategies, which are pending internal review:
        i. LCRA New Contracts/Contract Amendments – no details yet
        ii. Water Purchase/Water Purchase Amendments
            1. Barton Creek WSC
                a. Purchase Amendment from Travis County MUD 4
                b. Cost per 1,000 gallons: $5.00 > Cost per ac-ft: $1,629
            2. Creedmoor Maha WSC
                a. Purchase Amendment from Aqua WSC
                b. Cost per 1,000 gallons: $3.75 > Cost per ac-ft: $1,222
            3. Travis County MUD 14
                a. Purchase Amendment from Aqua WSC
                b. Cost per 1,000 gallons: $3.75 > Cost per ac-ft: $1,222
            4. Hays County Mining
                a. New Purchase from Buda (reuse) - Included in 2016 RWP
                b. Cost per 1,000 gallons: $4.90 > Cost per ac-ft: $1,597
    b. No discussion.

15. New / Other Business
    a. None.

16. Next Meeting
    a. The next WMS committee meeting will be held Thursday, October 3, 2019, 10:00 a.m. – 4:00 p.m.
    b. The next RWPG meeting will be October 9, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.

17. Public Comments
    a. Cindy Smiley requested that the plan specify whether a strategy was requested by a WUG or proposed by the planning group.
        i. Consultant agreed and explained that the plan currently has a section documenting WUG survey responses, however this information could be included in the overall WUG strategy application table as well.
    b. Cindy Smiley requested that the strategy descriptions identify if costs were calculated with the TWDB's costing tool or calculated externally. Consultant confirmed that this is included in strategy write-ups.

18. Lauri Gillam adjourned at 12:16 p.m.

Lower Colorado Regional Water Planning Group
Water Management Strategies Meeting
AECOM, Treaty Oak Conference Room
October 3, 2019

1. Lauri Gillam called meeting to order at 1:07 p.m.

2. Attendees (24)
   Committee Members:
   Lauri Gillam – Region K, Small Municipalities Rep, Water Management Strategies Committee Chair
   John Burke – Region K, Water Utilities Rep
   Daniel Berglund – Region K, Small Business Rep
   David Wheelock – Region K, River Authority Rep
   Jennifer Walker – Region K, Environmental Rep
   Mike Reagor – Region K, Small Municipalities Rep
   Teresa Lutes – Region K, Municipalities Rep
   Karen Haschke – Region K, Public Rep
   David Lindsay – Region K, Recreation Rep (Alternate)

   Additional Attendees:
   David Bradsby – Region K, TPWD Rep
   Christianne Castleberry – Region K, Water Utilities Rep (Alternate)
   Earl Foster – Region K, Small Municipalities (Alternate)
   Lann Bookout – TWDB
   Jaime Burke – AECOM
   Alicia Smiley – AECOM
   Kiera Brown – AECOM
   Helen Gerlach – Austin Water
   Richard Hoffpauir – Hoffpauir Consulting
   Joe Trungale – Trungale Engineering
   Rebecca Batchelder – LCRA
   Stacy Pandey – LCRA
   Valerie Miller – LCRA
   Leonard Oliver – LCRA
   Cindy Smiley – Smiley Law Firm
   Adam Connor – Freese & Nichols

3. Public Comments
   a. Jennifer Walker requested an expanded evaluation of environmental impact on either a cumulative or project-by-project basis. Jaime Burke responded that environmental impacts are assessed as write-ups are provided and a cumulative environmental impacts

analysis is included in Chapter 6 of the RWP. Joe Trungale noted that flow impacts are shown through the WAM, but other impacts are not clearly defined by the RWP process.

4. Minutes Approval
    a. Draft of September 16, 2019
        i. David Wheelock motioned to approve the minutes. Daniel Berglund seconded. Committee passed.

5. Status Update on Water Management Strategy Evaluations
    a. 41 strategies under RWPG or committee review.
    b. 29 strategies in progress/pending data.
    c. 0 strategies not started.
    d. The initially prepared plan (IPP) is due March 3.

6. Draft Strategy Review
    a. First drafts of strategy write-ups were previously presented to WMS committee for: Expand Use of Local Groundwater/Development of New Groundwater Supplies, Downstream Return Flows, Oceanwater Desalination, and Direct Reuse. Consultant incorporated comments from discussion.
        i. David Lindsay motioned to send the Expand Use of Local Groundwater/Development of New Groundwater Supplies strategies to the RWPG for review. David Wheelock seconded. Committee passed.
        ii. As Oceanwater Desalination has no sponsor, David Lindsay said brackish groundwater should be more seriously considered as a recommended strategy. Jaime Burke responded that both Austin and LCRA are sponsors of brackish groundwater strategies. Teresa Lutes suggested that the brackish groundwater discussion in the RWP include the limitations of current brackish water modeling and recognition that application of brackish water is evolving.
        iii. Downstream Return Flows – Teresa Lutes requested changing, "*…return flows from Pflugerville were also taken into consideration*" to, "*…return flows from Pflugerville are considered in the plan as a water management strategy*."
        iv. Lann Bookout requested Consultant note when costs are provided by WUGs as opposed to developed fully by the costing tool.
    b. Lauri Gillam motioned to send the additional strategies to the RWPG for review. Mike Reagor seconded. Committee passed.

7. Direct Potable Reuse
    a. Buda
        i. Online: 2030
        ii. Project Yield: 2,240 ac-ft/yr
        iii. Project Costs: Total Project Costs: $33,503,000; Annual Cost: $4,399,000; Unit Cost: $1,964/ac-ft

b. Dripping Springs WSC
    i. Online: 2030
    ii. Project Yield: 560 ac-ft/yr
    iii. Project Costs: Total Project Costs: $12,119,000; Annual Cost: $1,446,000; Unit Cost: $2,582/ac-ft
c. West Travis County PUA
    i. Online: 2030
    ii. Project Yield: 336 ac-ft/yr
    iii. Project Costs: Total Project Costs: $7,788,000; Annual Cost: $972,000; Unit Cost: $2,893/ac-ft
d. David Wheelock wanted to clarify that the RWPG is assuming the purchase of water is valued at $0, although he believes that in practice, the water transferred from wastewater treatment to water treatment is sold, such as the relationship between the city of Dripping Springs and Dripping Springs WSC. Wheelock requested to add that the valuation of water is assumed to be zero to the write-up. Lauri Gillam requested a line adding that further evaluation may be necessary in future cycles.
e. David Wheelock requested to change language for Dripping Springs WSC and West Travis County PUA to “considering” the strategy as they haven’t moved as quickly as Buda in the implementation of DPR. Lann Bookout responded that if a project is only under consideration, it may not be eligible for funding.
f. Daniel Berglund motioned to send the strategy to the RWPG for review. Karen Haschke seconded. Committee passed.

8. LCRA Water Management Strategy Evaluations
    a. No discussion.

9. Austin Water Management Strategy Evaluations
    a. No discussion.

10. Water Purchase and Contracts
    a. LCRA New Contracts/Contract Amendments
        i. Looking at a Bastrop Regional Project for Aqua WSC, Bastrop, and Bastrop County WCID #2
    b. Water Purchase/Water Purchase Amendments
        i. Considering for Barton Creek WSC, Creedmoor Maha WSC, Travis County MUD 14, Hays County Mining, Hays, and potentially Windemere (via the Blue Water 130 Pipeline).
    c. No discussion. Strategy will be reviewed at next WMS committee meeting.

11. Irrigation Conservation
    a. Irrigation Conservation

i. Draft write-ups provided: Tail Water Recovery, Sprinkler Irrigation, Drip Irrigation for Non-Rice Crops, and On-Farm Conservation.
    1. Tail Water Recovery – Daniel Berglund noted strategy yields were not realistic because with the implementation of land leveling, there is less tail water to recover.
    2. Drip Irrigation – David Wheelock asked if unit cost seemed high. Alicia Smiley responded that micro irrigation costs are due to the high annual maintenance costs.
    3. On-Farm Conservation – Stacy Pandey requested data sources be added to write-up and that consultant reach out to NRCS for cost update.

ii. Draft write-ups in progress: Irrigation Operations Conveyance Improvements and Real-Time Monitoring
    1. Consultant is coordinating with LCRA and Daniel Berglund to complete write-ups.

b. Irrigation Drought Management
    i. Stacy Pandey requested strategy include a discussion of the LCRA Water Management Plan (WMP).
    ii. David Wheelock said to clarify that demands assume two crops, and drought management reduces demands by assuming a portion of growers don't grow crops.

c. Mining Conservation
    i. Strategy Definition and Cost
        1. Mining conservation involves taking the existing pumped groundwater, once used, letting it settle, and then recycling it for additional use rather than pumping additional groundwater from the aquifer. Serves mining WUGs Bastrop and Burnet counties.
        2. Online: 2020
        3. Project Yield:
            a. Bastrop Mining: 2 ac-ft/yr (2020); 243 ac-ft/yr (2030); 308 ac-ft/yr (2040); 233 ac-ft/yr (2050)
            b. Burnet Mining: 1,000 ac-ft/yr (2020); 1,500 ac-ft/yr (2070)
        4. Project Costs: Assumed no facilities cost; energy costs included; Annual Cost: Bastrop Mining ($5,000), Burnet Mining ($45,000); Unit Cost: Bastrop Mining ($16/ac-ft), Burnet Mining ($30/ac-ft)
    ii. David Wheelock requested consultant reach out to Mitchell Sodek to review strategy.

12. Hays County Groundwater Importation
    a. Alliance Regional Water Authority Pipeline
        i. Strategy Definition and Cost

1. Withdrawal and transport of groundwater from the Carrizo-Wilcox aquifer in Gonzales County to 1-35 Corridor area near San Marcos, Kyle, and Buda; primarily Region L strategy. Serves Buda.
2. Online: 2030
3. Project Yield: 762 - 2,467 ac-ft/yr
4. Project Costs: Region L to provide updated costing; Total Project Costs: $34,996,869; Annual Cost: $4,751,402; Unit Cost: $1,926/ac-ft

ii. Discussion

1. David Wheelock requested the discussion of the MAG be removed from the environmental impacts, as it is a misrepresentation: the MAG is based on Desired Future Conditions, which is more than just environmental considerations. Additionally, the available yield is different than the MAG yield, and the terminology should be removed from the strategy.
2. David Wheelock requested changing "*Importing groundwater from a more rural area to a more populated area may limit future growth in the water-supplying area*" to "*In general, importing water from rural areas may affect rural users, as described in Chapter 8.*"

b. Hays County Pipeline

i. Strategy Definition and Cost

1. Withdrawal and transport of groundwater from the Carrizo-Wilcox aquifer in Kyle area to western Hays County; strategy shared with Region L. Serves Hays County-Other and West Travis County PUA.
2. Online: 2030
3. Project Yield:
   a. West Travis County PUA: 3,000 ac-ft/yr
   b. Hays County-Other: 1,000 ac-ft/yr
4. Project Costs: Total Project Costs: West Travis County PUA ($22,939,500), Hays County-Other ($7,616,500); Annual Cost: West Travis County PUA ($1,938,750), Hays County-Other ($646,250); Unit Cost: $646/ac-ft

ii. Discussion

1. David Wheelock noted that treated water currently has a zero cost, and a cost needs to be added to the supply purchase. Consultant will coordinate with Region L.
2. Committee requested removal of implementation issues from the environmental discussion and a reference to Chapter 10.

c. Strategies will be reviewed at next WMS committee meeting.

13. Brush Management

a. Strategy Definition and Cost

i. Convert land that is covered with brush (juniper, mesquite, saltcedar) to grasslands, increasing water availability through reduced extraction of soil water for transpiration and increased recharge to shallow groundwater and emergent springs. Serves Blanco, Hays, Gillespie, and Travis County-Other.
ii. Online: 2030
iii. Project Yield: 5,571 ac-ft/yr
iv. Project Costs: Total Project Costs: $29,707,000; Annual Cost: $2,379,000; Unit Cost: $427/ac-ft

b. Discussion
i. David Lindsay and David Wheelock commented that the yield may be too low. The project's yield is based on drought of record (2011) conditions, when inflows were 10% normal inflows. Updates to strategy were limited and based on budget available from scope of work. Next cycle, RWPG can request a more detailed scope of work to potentially model inflows.
ii. Strategy will be reviewed at next WMS committee meeting.

14. Wharton Water Supply
a. Strategy Definition and Cost
i. The 2017 Regional Water Supply Study for the City of Wharton and East Bernard recommended the use of additional groundwater; incorporated into Expand Use of Local Groundwater for Gulf Coast aquifer.
ii. Online: 2030
iii. Project Yield: 3,000 ac-ft/yr
iv. Project Costs: Total Project Costs: $9,100,000; Annual Cost: $817,000; Unit Cost: $272/ac-ft
b. No discussion. Strategy will be reviewed at next WMS committee meeting.

15. Remaining Draft Strategy Evaluations
a. Goldthwaite Strategy Request
i. Water Right Permit Amendment and expansion of Goldthwaite's reservoir storage capacity cannot be recommended as a strategy, as the yield is 0 ac-ft/yr during drought of record.
ii. No discussion.

16. Austin Strategy Edits
a. 7/15 strategies are completed and under review by Austin Water. Additional comments may be sent to Jaime Burke.
b. David Wheelock requested that strategies be consistent with TWDB and hydrologic variance rules.

17. Significant Water Needs

   a. Per HB807, “if a RWPA has significant identified water needs, provides a specific assessment of the potential for aquifer storage and recovery projects to meet those needs” (TWC§16.053(e)(10)).
   b. RWPG is to define the meaning of “significant needs.” Committee asked if RWPG could parsing the needs so that irrigation does not count as significant. David Wheelock suggested a municipal need of 10,000 ac-ft/yr be considered significant.

18. Scope of Work Amendments
    a. SubTask Budget Amendments
        i. Reuse ($14,000 > $28,000)
        ii. Austin Conservation ($2,000 > $3,000)
        iii. Austin Blackwater and Greywater Reuse ($1,000 > $2,500)
        iv. Austin Onsite Rainwater and Stormwater Harvesting ($1,000 > $2,500)
    b. Amendments will be presented and discussed at Region K RWPG meeting.

19. New / Other Business
    a. None.

20. Next Meeting
    a. A Doodle poll will be sent out to determine the date of next WMS committee meeting for the last week of October.
    b. The next RWPG meeting will be October 9, 2019 at 10:00 a.m. at the LCRA Dalchau Service Center.

21. Public Comments
    a. None.

22. Teresa Lutes adjourned at 4:09 p.m.

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CHAPTER 6.0: IMPACTS OF REGIONAL WATER PLAN

6.1 SCOPE OF WORK

A major goal of the regional water planning process is the protection of the State's water, agricultural, and natural resources. This Chapter presents the results of Task 6 of the Project Scope, which addresses:

- Evaluation of the estimated cumulative impacts of the Regional Water Plan (RWP), for example on groundwater levels, spring discharges, bay and estuary inflows, and instream flows.
- Assessment of the impact of the RWP on designated unique river or stream segments by the Legislature.
- Description of the impacts of the RWP regarding:
  - Agricultural Resources;
  - Other Water Resources of the State including other Water Management Strategies and groundwater and surface water interrelationships;
  - Threats to Agricultural and Natural Resources;
  - Third-party social and economic impacts resulting from voluntary redistributions of water including analysis of third-party impacts of moving water from rural and agricultural areas;
  - Major impacts of recommended Water Management Strategies on key parameters of water quality, and;
  - Effects on Navigation.
- Summarization of the identified water needs that remain unmet by the RWP

6.2 CUMULATIVE IMPACTS OF THE REGIONAL WATER PLAN

The impacts of individual water management strategies on Colorado River instream flows and bay and estuary freshwater inflows were discussed in Chapter 5. The TWDB also requires an analysis of what the cumulative impacts of the recommended water management strategies would be to the Colorado River and Matagorda Bay.

For the 2021 Region K Water Plan, many of the recommended water management strategies utilize water under existing water rights, which includes full use of wastewater effluent at 100 percent, consistent with the required surface water availability modeling guidelines. The baseline water availability analyses are conducted using full use of existing water rights; therefore the water for the strategies in the Colorado River basin is generally accounted for in the baseline model simulation.

In general, off-channel reservoirs that utilize existing water rights should not create additional impacts to the system, although variations to instream flows could be expected to occur. Additional groundwater that is used and then discharged to a local stream can create additional flow downstream, but the additional pumping can also potentially lower the water table and reduce spring flows in the area. Reuse of wastewater effluent reduces return flows, but it also reduces the need to divert additional surface water to meet demands. Aquifer Storage and Recovery (ASR) has the potential to reduce higher levels of surface water or groundwater by storing it when it's available, but then also has the potential to keep stream and aquifer levels higher during times of drought by providing an additional source of water. Conservation and drought management are strategies that encourage efficient and responsible use of the region's water resources.

When return flows are present, they contribute to instream flows and bay and estuary inflows. They provide a consistent source of flow in the river, even when a portion of the return flows are reused. Return flows are a source of flow that is not included in the surface water availability modeling and show a positive impact to the system as a water management strategy.

Groundwater strategies recommended by the Lower Colorado Regional Water Planning Group (LCRWPG) had yields within the identified Modeled Available Groundwater (MAG) volumes, which are determined based on the Desired Future Condition (DFC) of each aquifer. Groundwater Conservation Districts will continue to monitor aquifer levels to determine if future changes to the DFC and MAG are needed.

The recommendation by the LCRWPG of strategies such as conservation, reuse, and drought management will reduce demands, which will help to maintain the spring discharges in the region, especially during times of drought. In addition, recommended strategies such as off-channel reservoirs and aquifer storage and recovery may aid in balancing peak demands for surface water and groundwater, which could also help maintain spring flows in the region.

6.2.1 Environmental Flow Impacts of Water Management Strategies

Sufficient water to meet environmental needs and to maintain a sound ecological environment in the Colorado River and Matagorda Bay is important to the economic and environmental health of Region K. The qualitative and quantitative environmental impacts for the recommended water management strategies have been evaluated as part of the 2021 Region K Water Plan. In addition, strategies that would require new or amended water rights were evaluated while incorporating the TCEQ environmental flow requirements that were determined as part of the Senate Bill 3 (SB3) process.

As part of the SB3 process, the Colorado/Lavaca River and Matagorda Bay Basin Expert Science Team (BBEST) studied available data and developed a set of recommendations for the freshwater inflows that would be needed to maintain a sound ecological environment in Matagorda Bay. *Table 6.1* compares the BBEST recommended freshwater inflow components and the attainment frequencies needed to maintain a sound ecological environment with the current TCEQ WAM Run 3 attainment frequencies. TCEQ WAM Run 3 provides information on the amount of unappropriated water available for meeting environmental flow needs and other demands assuming full use of water rights in the basin with no return flows. *Table 6.1* below shows that with full use of water rights that the attainment frequencies for the five (5) flow regimes will not be met under a WAM Run 3 regime.

The members of the Region K water planning group are concerned about meeting environmental needs to maintain a sound ecological environment and we recommend that the planning group take proactive steps during the next round of planning to incorporate strategies to address this shortfall. The planning process is not currently designed to fully address environmental needs.

Table 6.1: Comparison of BBEST recommendations for Matagorda Bay Inflows from Colorado River Basin to WAM Run3 values

Regime Title	BBEST Recommended Value	WAM Run3 Calculated Value
Attainment Frequency for Threshold Regime	100%	68%
Attainment Frequency for MBHE1 Regime	90%	57%
Attainment Frequency for MBHE2 Regime	75%	51%
Attainment Frequency for MBHE3 Regime	60%	30%
Attainment Frequency for MBHE4 Regime	35%	8%
Average Annual Volume	1.4 to 1.5 million ac-ft	973,085 ac-ft
Coefficient of Variation for Volume	Above 0.8	1

6.2.2 Criteria Used

The Region K Cutoff strategy model was used for the evaluation of the recommended water management strategies that involve surface water. The assumptions used for the strategy model are listed in *Chapter 3, Appendix 3B*. The Adopted TCEQ Environmental Flow Standards for the Colorado River and Matagorda Bay were used for the evaluations.

6.2.2.1 Matagorda Bay Freshwater Inflow Criteria

The following tables are taken from the *Matagorda Bay Health Evaluation* as part of the LSWP Studies to help define the criteria used for environmental impact analysis of the freshwater inflows to Matagorda Bay (Control Point M10000 in the Region K Cutoff model). The MBHE used the latest data and science to assess the relationship between various factors and bay conditions[1], and the criteria has been incorporated into the Adopted TCEQ Environmental Flow Standards for Matagorda Bay. Several measures of bay health were investigated, including salinity, habitat condition, species abundance, nutrient supply and benthic condition. The computer models and data analysis in the study were used to develop inflow criteria for the Colorado River. Salinity, habitat and benthic modeling were used to develop criteria for most levels, but additional measures of bay health were used wherever possible.

[1] FINAL REPORT: MATAGORDA BAY INFLOW CRITERIA (COLORADO RIVER), MATAGORDA BAY HEALTH EVALUATION, Prepared for LCRA and SAWS (Dec. 2008).

Table 6.2: Inflow Categories and Range of Inflow Criteria

Inflow Category	Inflow Criteria	Description
LONG-TERM	Long-term Average Volume and Variability	provide adequate bay food supply to maintain the essential food supply and existing primary productivity of the bay system
MBHE INFLOW REGIME	MBHE 4	provide inflow variability and support high levels of primarily productivity, and high quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat.
	MBHE 3	provide inflow variability and support quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat.
	MBHE 2	provide inflow variability and sustain oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat
	MBHE 1	maintain tolerable oyster reef health, benthic character, and habitat conditions
MINIMUM	Threshold	refuge conditions for all species and habitats

Table 6.2 above shows the different levels of criteria and gives a description of what each level of flow can provide to the bay. There are three categories of criteria: long-term, minimum, and the MBHE inflow regime, which consists of four levels of increasing flow volumes.

Table 6.3 shows specific numerical flow volumes for the four levels of the MBHE inflow regime, which are separated into three "seasons." Achievement guidelines for the percentage of time a particular MBHE level should be met are also provided. It should be noted that the achievement guidelines are provided as information, but that the environmental impact analysis that was done for the water management strategies as part of the 2021 Region K Plan did not try to determine whether or not the recommended strategies were reasonable based on whether the cumulative impacts caused the freshwater inflows to go above or below a particular value. Again, the main comparison for the study was the flow with and without the strategies implemented.

Table 6.3: Recommended MBHE Inflow Regime Criteria and Proposed Distribution

Onset Month	Flow Distribution (% of annual)	INFLOW CRITERIA (Acre-feet)			
		MBHE 1	MBHE 2	MBHE 3	MBHE 4
Spring January February March April May	38%	114,000 ac-ft 3 consecutive month total	168,700 ac-ft 3 consecutive month total	246,200 ac-ft 3 consecutive month total	433,200 ac-ft 3 consecutive month total
Fall August September October	27%	81,000 ac-ft 3 consecutive month total	119,900 ac-ft 3 consecutive month total	175,000 ac-ft 3 consecutive month total	307,800 ac-ft 3 consecutive month total
Intervening Six months	35%	105,000 ac-ft Total for 6 month period	155,400 ac-ft Total for 6 month period	226,800 ac-ft Total for 6 month period	399,000 ac-ft Total for 6 month period
Achievement Guideline		90%	75%	60%	35%

6.2.2.2 Lower Colorado River Instream Flow Criteria

The following tables show the TCEQ Environmental Flow Standards for the Lower Colorado River Instream Flow Criteria that was used for environmental impact analysis of the water management strategies on the Colorado River instream flows at various control points downstream of the Highland Lakes.

Table 6.4 provides the instream flow guidelines (in cfs) for three different categories of flow conditions and four separate reaches downstream of the Highland Lakes. The Austin Reach begins at Control Point I20000 in Travis County. The Bastrop Reach begins at Control Point J30000 in Bastrop County. The Columbus Reach begins at Control Point J10000 in Colorado County. The Wharton Reach begins at Control Point K20000 in Wharton County. The three categories of flow are: Subsistence, Base-Dry Conditions, and Base-Average Conditions. The TCEQ Environmental Flow Standards also recommend pulse flows, but the modeling used to analyze the environmental impacts is a monthly flow application, which makes it difficult to analyze pulse flows which occur on a daily level rather than monthly. The Austin Reach only has a Subsistence Flow guideline due to the limited locations of return flows downstream of the Longhorn Dam.

Table 6.4: TCEQ Environmental Flow Standards for Instream Flow for the Lower Colorado River (cfs)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AUSTIN REACH												
Subsistence	50	50	50	50	50	50	50	50	50	50	50	50
BASTROP REACH												
Subsistence	208	274	274	184	275	202	137	123	123	127	180	186
Base-DRY	313	317	274	287	579	418	347	194	236	245	283	311
Base-AVERAGE	433	497	497	635	824	733	610	381	423	433	424	450
COLUMBUS REACH												
Subsistence	340	375	375	299	425	534	342	190	279	190	202	301
Base-DRY	487	590	525	554	966	967	570	310	405	356	480	464
Base-AVERAGE	828	895	1,020	977	1,316	1,440	895	516	610	741	755	737
WHARTON REACH												
Subsistence	315	303	204	270	304	371	212	107	188	147	173	202
Base-DRY	492	597	531	561	985	984	577	314	410	360	486	470
Base-AVERAGE	838	906	1,036	1,011	1,397	1,512	906	522	617	749	764	746

Table 6.5 provides the instream flow guidelines in ac-ft/yr, rather than cfs.

Table 6.5: Instream Flow Guidelines for the Lower Colorado River (ac-ft/yr))

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AUSTIN REACH												
Subsistence	3,074	2,777	3,074	2,975	3,074	2,975	3,074	3,074	2,975	3,074	2,975	3,074
BASTROP REACH												
Subsistence	12,789	15,217	16,848	11,127	16,909	12,020	8,424	7,563	7,319	7,809	10,711	11,437
Base-DRY	19,246	17,605	16,848	17,078	35,601	24,873	21,336	11,929	14,043	15,064	16,840	19,123
Base-AVERAGE	26,624	27,602	30,559	37,785	50,666	43,617	37,507	23,427	25,170	26,624	25,230	27,669
COLUMBUS REACH												
Subsistence	20,906	20,826	23,058	17,792	26,132	31,775	21,029	11,683	16,602	11,683	12,020	18,508
Base-DRY	29,944	32,767	32,281	32,965	59,397	57,540	35,048	19,061	24,099	21,890	28,562	28,530
Base-AVERAGE	50,912	49,706	62,717	58,136	80,918	85,686	55,031	31,728	36,298	45,562	44,926	45,316
WHARTON REACH												
Subsistence	19,369	16,828	12,543	16,066	18,692	22,076	13,035	6,579	11,187	9,039	10,294	12,420
Base-DRY	30,252	33,156	32,650	33,382	60,565	58,552	35,478	19,307	24,397	22,136	28,919	28,899
Base-AVERAGE	51,527	50,317	63,701	60,159	85,898	89,970	55,708	32,097	36,714	46,054	45,461	45,870

The instream flow impact analysis was focused on a comparison of the percentage of time the model met these values, both with and without the strategies implemented. The impact is shown as the difference between the two scenarios, rather than how often either the base model or the model with the strategies met the criteria.

6.2.3 Evaluated Water Management Strategies and Results

Several of the strategies recommended in the 2021 Region K Water Plan have been included in the cumulative impacts analysis on environmental flows.

- Austin Return Flows
- Downstream Return Flows (Pflugerville)
- Import Return Flows from Williamson County
- Austin Off-Channel Reservoir

- Austin Aquifer Storage and Recovery (ASR)
- LCRA Enhanced Recharge (MAR)
- LCRA Aquifer Storage and Recovery (ASR)
- LCRA Excess Flows Off-Channel Reservoir
- LCRA Mid-Basin Off-Channel Reservoir
- Baylor Creek Reservoir

The strategy evaluation began with the creation of a base model (Region K Cutoff Model – strategy version.) The assumptions used for the strategy base model are listed in *Chapter 3, Appendix 3B.* The results from the model runs from this base model were compared to the results from the model runs from the base plus strategies model. As mentioned earlier, the return flow water management strategies provide positive impacts to the instream flows and freshwater inflow to Matagorda Bay, while the other strategies tend to have either negligible impacts or in some cases may remove some flows from the river and bay. *Table 6.6* shows a comparison of how frequently the attainment goals for the freshwater inflows to Matagorda Bay are met with and without the cumulative strategies. *Appendix 6A* includes a similar table (*6A.1*) that contains an additional column showing the impacts of just the return flow strategies.

Table 6.6: Frequency Attainment of TCEQ Environmental Flow Standards for Freshwater Inflows to Matagorda Bay

SPRINGTIME ONSET FLOW CRITERIA MET (3 CONSECUTIVE MONTHS DURING JAN-MAY)						
CRITERIA	TARGET	BASE		CUMULATIVE		DIFFERENCE
	(AC-FT)	#YEARS	%	#YEARS	%	%
MBHE 1	114,000	51	66.2%	51	66.2%	0.0%
MBHE 2	168,700	46	59.7%	47	61.0%	1.3%
MBHE 3	246,200	43	55.8%	44	57.1%	1.3%
MBHE 4	433,200	31	40.3%	34	44.2%	3.9%

FALL ONSET FLOW CRITERIA MET (3 CONSECUTIVE MONTHS DURING AUG-OCT)						
CRITERIA	TARGET	BASE		CUMULATIVE		DIFFERENCE
	(AC-FT)	#YEARS	%	#YEARS	%	%
MBHE 1	81,000	56	72.7%	54	70.1%	-2.6%
MBHE 2	119,900	51	66.2%	51	66.2%	0.0%
MBHE 3	175,000	46	59.7%	46	59.7%	0.0%
MBHE 4	307,800	41	53.2%	41	53.2%	0.0%

INTERVENING SIX MONTHS FLOW CRITERIA MET						
CRITERIA	TARGET	BASE		CUMULATIVE		DIFFERENCE
	(AC-FT)	#YEARS	%	#YEARS	%	%
MBHE 1	105,000	52	67.5%	52	67.5%	0.0%
MBHE 2	155,400	46	59.7%	49	63.6%	3.9%
MBHE 3	226,800	45	58.4%	46	59.7%	1.3%
MBHE 4	399,000	34	44.2%	34	44.2%	0.0%

NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET						
CRITERIA	TARGET	BASE		CUMULATIVE		DIFFERENCE
	(AC-FT/mo)	#MONTHS	%	#MONTHS	%	%
THRESHOLD	15,000	584	63.2%	631	68.3%	5.1%

Table 6.7 shows a comparison of how frequently the attainment goals for the Colorado River instream flows are met at Bastrop, Columbus, and Wharton, with and without strategies. *Appendix 6A* includes a

similar table (*6A.2*) that contains an additional column showing the impacts of just the return flow strategies.

Table 6.7: Frequency Attainment of TCEQ Environmental Flow Standards for Colorado River Instream Flows

		TARGET ATTAINMENT FREQUENCY				TARGET ATTAINMENT FREQUENCY				TARGET ATTAINMENT FREQUENCY			
		100%				80%				60%			
		SUBSISTENCE FLOWS				BASE FLOWS - DRY CONDITIONS				BASE FLOWS - AVERAGE CONDITIONS			
CP J30000	MONTH	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE
		(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%
Bastrop	Jan	12,786	100.0%	93.5%	-6.5%	19,241	85.7%	87.0%	1.3%	26,618	53.2%	68.8%	15.6%
	Feb	15,349	90.9%	92.2%	1.3%	17,758	81.8%	88.3%	6.5%	27,842	46.8%	57.1%	10.4%
	Mar	16,844	100.0%	96.1%	-3.9%	16,844	100.0%	96.1%	-3.9%	30,552	51.9%	68.8%	16.9%
	Apr	10,946	100.0%	98.7%	-1.3%	17,074	94.8%	98.7%	3.9%	37,776	51.9%	74.0%	22.1%
	May	16,905	100.0%	98.7%	-1.3%	35,593	79.2%	87.0%	7.8%	50,654	62.3%	64.9%	2.6%
	Jun	12,017	100.0%	100.0%	0.0%	24,867	97.4%	100.0%	2.6%	43,606	80.5%	92.2%	11.7%
	Jul	8,422	100.0%	100.0%	0.0%	21,331	97.4%	100.0%	2.6%	37,499	74.0%	94.8%	20.8%
	Aug	7,561	100.0%	100.0%	0.0%	11,926	100.0%	100.0%	0.0%	23,421	85.7%	100.0%	14.3%
	Sep	7,317	100.0%	100.0%	0.0%	14,040	100.0%	100.0%	0.0%	25,164	84.4%	97.4%	13.0%
	Oct	7,807	100.0%	100.0%	0.0%	15,061	89.6%	100.0%	10.4%	26,618	58.4%	83.1%	24.7%
	Nov	10,708	98.7%	98.7%	0.0%	16,836	67.5%	94.8%	27.3%	25,224	48.1%	66.2%	18.2%
	Dec	11,434	97.4%	100.0%	2.6%	19,118	67.5%	94.8%	27.3%	27,663	45.5%	64.9%	19.5%
	Non-Attainment		3	6			3	0			7	1	

		SUBSISTENCE FLOWS				BASE FLOWS - DRY CONDITIONS				BASE FLOWS - AVERAGE CONDITIONS			
CP J10000	MONTH	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE
		(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%
Columbus	Jan	20,901	100.0%	100.0%	0.0%	29,937	72.7%	74.0%	1.3%	50,900	44.2%	46.8%	2.6%
	Feb	21,007	85.7%	88.3%	2.6%	33,052	66.2%	68.8%	2.6%	50,138	44.2%	45.5%	1.3%
	Mar	23,052	100.0%	100.0%	0.0%	32,273	62.3%	67.5%	5.2%	62,702	40.3%	41.6%	1.3%
	Apr	17,788	100.0%	100.0%	0.0%	32,957	71.4%	83.1%	11.7%	58,122	48.1%	48.1%	0.0%
	May	26,126	100.0%	100.0%	0.0%	59,383	67.5%	72.7%	5.2%	80,898	48.1%	51.9%	3.9%
	Jun	31,768	98.7%	100.0%	1.3%	57,527	74.0%	77.9%	3.9%	85,666	42.9%	42.9%	0.0%
	Jul	21,024	100.0%	100.0%	0.0%	35,040	75.3%	89.6%	14.3%	55,018	50.6%	57.1%	6.5%
	Aug	11,680	100.0%	100.0%	0.0%	19,057	94.8%	100.0%	5.2%	31,720	59.7%	76.6%	16.9%
	Sep	16,598	100.0%	100.0%	0.0%	24,093	90.9%	98.7%	7.8%	36,289	63.6%	72.7%	9.1%
	Oct	11,680	98.7%	100.0%	1.3%	21,884	79.2%	94.8%	15.6%	45,551	54.5%	55.8%	1.3%
	Nov	12,017	97.4%	100.0%	2.6%	28,555	58.4%	67.5%	9.1%	44,915	42.9%	49.4%	6.5%
	Dec	18,503	96.1%	100.0%	3.9%	28,523	55.8%	75.3%	19.5%	45,306	40.3%	50.6%	10.4%
	Non-Attainment		5	1			10	7			11	10	

		SUBSISTENCE FLOWS				BASE FLOWS - DRY CONDITIONS				BASE FLOWS - AVERAGE CONDITIONS			
CP K20000	MONTH	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE	FLOW	base	cumul	DIFFERENCE
		(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	%
Wharton	Jan	19,364	100.0%	100.0%	0.0%	30,245	72.7%	80.5%	7.8%	51,514	53.2%	55.8%	2.6%
	Feb	16,974	98.7%	98.7%	0.0%	33,444	64.9%	71.4%	6.5%	50,754	48.1%	49.4%	1.3%
	Mar	12,540	100.0%	100.0%	0.0%	32,642	55.8%	59.7%	3.9%	63,686	42.9%	44.2%	1.3%
	Apr	16,062	100.0%	100.0%	0.0%	33,374	58.4%	67.5%	9.1%	60,144	45.5%	50.6%	5.2%
	May	18,688	100.0%	100.0%	0.0%	60,551	51.9%	50.6%	-1.3%	85,878	44.2%	46.8%	2.6%
	Jun	22,071	97.4%	100.0%	2.6%	58,538	44.2%	46.8%	2.6%	89,949	35.1%	37.7%	2.6%
	Jul	13,032	97.4%	98.7%	1.3%	35,470	35.1%	50.6%	15.6%	55,695	31.2%	29.9%	-1.3%
	Aug	6,578	97.4%	100.0%	2.6%	19,303	40.3%	58.4%	18.2%	32,089	28.6%	37.7%	9.1%
	Sep	11,184	97.4%	100.0%	2.6%	24,391	55.8%	68.8%	13.0%	36,705	45.5%	49.4%	3.9%
	Oct	9,037	96.1%	100.0%	3.9%	22,130	68.8%	80.5%	11.7%	46,043	48.1%	53.2%	5.2%
	Nov	10,292	98.7%	100.0%	1.3%	28,912	62.3%	72.7%	10.4%	45,450	45.5%	53.2%	7.8%
	Dec	12,418	96.1%	100.0%	3.9%	28,892	67.5%	74.0%	6.5%	45,859	48.1%	54.5%	6.5%
	Non-Attainment		8	2			12	10			12	12	

Decreases in target attainment at the Bastrop gage may be attributed to modeling assumptions regarding when instream flow targets are turned on and off relative to strategy diversions and the timing of how they are applied to senior and junior water rights. The impacts on the remaining conditions and gages are mainly positive, due in large part to the return flows, and in general decrease the number of non-attainment months.

6.3 ASSESSMENT OF IMPACT ON DESIGNATED UNIQUE RIVER OR STREAM SEGMENTS

Region K does not have any designated unique stream segments or reservoir sites, so there are no impacts from the regional water plan.

6.4 IMPACTS OF WATER MANAGEMENT STRATEGIES ON WATER RESOURCES

A major goal of the regional water planning process is the protection of the State's water, agricultural, and natural resources. This focus has been considered throughout the planning process by the Lower Colorado Regional Water Planning Group (LCRWPG) when selecting water management strategies to meet water needs for the future. Conservation and drought management were considered as initial strategies for meeting water needs. Impacts on the State's resources have been considered before recommending other strategies. The effects of the recommended water management strategies on specific resources are discussed in further detail within this Section.

6.4.1 Agricultural Resources

Rice production in the lower three counties of the Lower Colorado Regional Water Planning Area (LCRWPA) is the agricultural resource most dependent upon a reliable, extensive water supply. LCRA's water rights in these counties used for rice farming are some of the most senior rights within the entire Colorado River Basin. However, the irrigators using these water rights do not have a sufficiently reliable supply of water under drought-of-record (DOR) conditions.

The management strategies introduced in Chapter 5 of this regional water plan were created to meet the needs of all WUGs including agricultural needs. Primarily, the unmet agricultural needs in the LCRWPA are related to rice irrigation in the lower counties of Colorado, Wharton, and Matagorda. These needs have been partially met with recommended water management strategies to help reduce the projected shortages. The use of interruptible water supplies, return flows from Austin, on-farm conservation, conveyance improvements, conversion to sprinkler irrigation, and real-time monitoring will help to reduce the water needs, but will not eliminate them completely.

6.4.2 Other Water Resources of the State including Groundwater and Surface Water Interrelationships

Water resources available by basin within the LCRWPA are discussed in further detail below.

6.4.2.1 Brazos River Basin

Portions of Bastrop, Burnet, Mills, Travis, and Williamson Counties are within the Brazos River Basin. Local supplies are the only surface water sources originating from the Brazos River Basin in the LCRWPA. The portion of Williamson County within the LCRWPA is within the service area of Austin (Austin Water) and the Lower Colorado River Authority (LCRA) and is served by their respective water supplies from the Colorado River Basin.

Groundwater supplies in the Brazos River Basin are obtained primarily from the Carrizo-Wilcox, Hickory, and Trinity aquifers. Groundwater is also available in lesser quantities from the Edwards-Balcones Fault Zone (BFZ), Ellenburger-San Saba, Gulf Coast, Marble Falls, Queen City, Sparta, Yegua-Jackson, and other unnamed aquifers.

Areas that are supplied from groundwater in the Brazos River Basin would be expected to discharge less water from treatment plants after implementing conservation measures. As wastewater effluent is often an important portion of instream flows, especially during dry periods, conservation measures may result in reduced stream flows.

Expanding the use of groundwater will generally increase the amount of return flows to streams.

6.4.2.2 Brazos-Colorado Coastal River Basin

The Brazos-Colorado Coastal River Basin includes portions of Colorado, Matagorda, and Wharton Counties. The only surface water source for this basin in the LCRWPA that is not a local supply is a run-of-river (ROR) right from the San Bernard River. However, surface water originating in the Colorado River Basin is transferred to the Brazos-Colorado Coastal River Basin for agricultural use and is subsequently released to streams in the process of rice production. The entirety of the Brazos-Colorado River Basin within the LCRWPA is served by the Gulf Coast aquifer.

As in the other basins of the LCRWPA, increased groundwater usage may have potential impacts on water quantity in stream channels but possible adverse effects on water quality in some cases. Conservation programs implemented through the LCRA or local farmers may decrease return flows within the Brazos-Colorado Coastal Basin during dry periods and introduce less water from the Colorado River Basin for irrigation use, due to reduced demands.

6.4.2.3 Colorado River Basin

Since the LCRWPA is centered on the Colorado River Basin, nearly every recommended management strategy has the potential to impact water quantity and quality in the basin.

The Colorado River Basin constitutes the largest portion of the LCRWPA as well as the single largest source of water for the region. The Highland Lakes System, operated by the Lower Colorado River Authority (LCRA), provides firm surface water supplies throughout the lower part of the basin. A large amount of water is also available from run-of-river (ROR) supplies in the basin. Other reservoirs in the system provide small yields or receive their water from the Highland Lakes System or a ROR right. The largest amounts of groundwater in the Colorado River Basin are available from the Gulf Coast, Carrizo-Wilcox, Trinity, and Ellenburger-San Saba aquifers. These four (4) aquifers represent approximately 80 percent of the available groundwater supply with various other aquifers providing the remaining 20 percent.

Currently, Austin's discharged effluent travels downstream where it can be diverted under existing water rights and flows in the river from the points of discharge to the downstream points of diversion. There are several recommended Austin strategies that incorporate a portion of the effluent as the strategy's source of water. It is possible that Austin reuse will become comprehensive enough to reduce these total flows considerably in later decades, though that is not currently projected to occur within the planning horizon for this planning cycle. While the amount of reuse is projected to increase, the amount of Austin's municipal return flows above the reuse strategy amounts are also projected to increase over the planning period. These projected amounts of return flows as a water management strategy for the planning period are updated as part of the planning process each cycle.

New contracts and contract amendments may also decrease total flow due to decreased availability to agricultural irrigation and may result in higher concentrations of effluent in the river below wastewater discharges in certain areas during low flow periods.

Operation of the Highland Lakes System with one or more new downstream off-channel reservoirs as well as an Austin off-channel reservoir will create additional available firm water and may be beneficial to instream flows during some periods. In addition, it could reduce the amount of stored water in the Highland Lakes that has to be released to meet downstream demands.

Conservation practices for agricultural irrigation will reduce the demand for stored surface water and thereby result in reduced streamflow, although sediment and nutrient loads from irrigation tail water would be reduced, as well.

Portions of Matagorda and Wharton Counties are within the Colorado-Lavaca Coastal River Basin. All surface water sources in these areas are associated with local supplies or stored water from the Highland Lakes. However, as in the Brazos-Colorado Coastal River Basin, water from the Colorado River Basin is discharged into streams following its use in rice production, and all groundwater supplies are obtained from the Gulf Coast aquifer.

As in the other basins of the LCRWPA, increased groundwater usage may have potential positive impacts on water quantity in stream channels but possible adverse effects on water quality in some cases. Again, conservation programs for irrigation may decrease stream flows during dry periods and introduce less water from the Colorado River Basin for irrigation use.

6.4.2.4 Lavaca River Basin

The western portions of Colorado and Fayette Counties are located in the Lavaca River Basin. There are no firm surface water rights available from the Lavaca River Basin within these two (2) counties. Additionally, the only reservoir in this basin, Lake Texana, is not located in the LCRWPA, and no surface water contracts serve water user groups (WUGs) in the region from Lavaca River Basin supplies. All surface water supplies in the basin are obtained from local supplies. The primary source of groundwater for the Lavaca River Basin in the LCRWPA is the Gulf Coast aquifer.

As in the Brazos and Colorado River Basins, municipal conservation could possibly impair water quality. However, areas served by groundwater would experience some benefit from increased stream flows from additional pumpage, although groundwater quality issues may introduce additional problems to stream water quality in certain instances.

As in the other basins, conservation programs for irrigation may decrease stream flows during dry periods and introduce less water from the Lavaca River Basin for irrigation use.

6.4.2.5 Guadalupe River Basin

The Guadalupe River Basin includes portions of Bastrop, Blanco, Fayette, Hays, and Travis counties within the LCRWPA. No major reservoirs exist within the LCRWPA section of the Guadalupe River Basin, and the only firm surface water source is provided by two (2) minor reservoirs operated by the City of Blanco. Other surface water sources are obtained from local supplies.

The Carrizo-Wilcox and Ellenburger-San Saba aquifers are the major groundwater sources for the Guadalupe River Basin. Other smaller groundwater sources include the Edwards-BFZ, Edwards-Trinity, Gulf Coast, Queen City, Sparta, Trinity, and Yegua-Jackson aquifers.

As in the other basins, expanded groundwater usage is expected to increase stream flows with a possibility of negatively impacting water quality from additional discharges and groundwater quality issues.

6.4.3 Threats to Agricultural and Natural Resources

The water management strategies recommended for the LCRWPA in this RWP are intended to protect natural resources while still meeting the projected water needs of the region. The impacts of recommended strategies on specific resources are discussed below.

6.4.3.1 Threatened and Endangered Species

The LCRWPA contains an array of habitats for a variety of wildlife species. A number of these species are listed as threatened or endangered by federal or state authorities, proposed as candidates to be listed, or are otherwise rare but unlisted species. A comprehensive list of these species can be found in *Appendix 1A* of *Chapter 1* in this RWP.

The potential impacts to threatened and endangered species are expected to be limited. The construction of infrastructure related to these strategies may potentially impact one or more of the species identified in *Appendix 1A*.

6.4.3.2 Parks and Public Lands

As described in *Chapter 1*, over 23,000 acres of state parks are within the boundaries of the LCRWPA. These 11 state facilities host a variety of outdoor recreational opportunities for visitors from around the state of Texas. None of the recommended water management strategies are expected to have impacts on public lands. In addition, there are no foreseen impacts to stream segments traversing public lands. Additional information concerning impacts from each strategy can be found in *Chapter 5*.

6.4.4 Third-party Social and Economic Impacts resulting from Voluntary Redistributions of Water

While the LCRWPG has not specifically recommended a “voluntary redistribution of water” strategy, the term essentially means one entity providing surplus water to another entity in need of water. Recommended strategies in the 2021 Region K Plan that would fall under this category include the Water Purchase strategy, as well as the New LCRA Contracts and LCRA Contract Amendment strategies.

Because the redistribution of water is voluntary, it is assumed that the existing water supplies would not be redistributed if doing so caused negative social and economic impacts to the entity selling the water. In most cases, it can be anticipated that there would be a positive economic impact to the entity selling the water, and a positive social impact to the entity purchasing the water.

6.4.5 Moving Water from Rural and Agricultural Areas

It is estimated that in Year 2020, the water used in rural (livestock) and agricultural areas will represent 53 percent of the total water used in Region K. It is estimated that this will be reduced to 40 percent of the Region's 1,307,643 ac-ft demand projected in Year 2070 as a result of growth in municipal and industrial demands and a decrease in agricultural production. The projected decrease in irrigation demand is anticipated to be approximately 12 percent between 2020 and 2070. Livestock demand is constant over the planning period.

Water management strategies, along with current sources of water supply, are available to agricultural users throughout the planning period; therefore, the impacts on agricultural users are not directly related to moving water from these areas. The potential impacts of moving water from rural and agricultural areas are mainly associated with socio-economic impacts to third parties. The potential impetus for moving water is expected to occur from two (2) sources: (1) the cost of raw water may become too great for the local irrigator to afford, and they may elect to voluntarily leave the industry for economic reasons; or (2) the value of the water for municipal or industrial purposes may create a market for the wholesale owner to redirect the sale of the water making it unavailable to the irrigator. Several management strategies are outlined in the RWP to provide water to irrigators, especially in the lower basin counties of Colorado, Wharton, and Matagorda, but do not meet all of the projected water needs.

It may be feasible for a third party to pay for conservation measures and then utilize the saved water for their own needs (through re-contracting or other agreements) and allow the irrigator to remain in business; however, there are few contractual and institutional measures in effect to allow this trade-off to occur at this time.

There are two strategies in the 2021 Region K Plan that import water from other regions. The areas that the water is developed from are rural in nature. While the water that is being imported is available under planning and permitting rules and should not impact the water supply of the local residents or agriculture, the ability to access the water may become more expensive, especially in the case of groundwater.

6.5 IMPACTS OF WATER MANAGEMENT STRATEGIES ON KEY PARAMETERS OF WATER QUALITY

The potential impacts that water management strategies (WMS) may have on water quality are discussed in this section, including the identified water quality parameters which are deemed important to the use of the water resources within the Region.

Under the Clean Water Act, the State of Texas must define designated uses for all major water bodies and, consequently, the water quality standards that are appropriate for that designated water use. The water quality parameters which are listed for the Lower Colorado Regional Water Planning Area (LCRWPA) below were selected based on the *Texas Commission on Environmental Quality (TCEQ) Water Quality Inventory for Designated Water Body Uses* as well as the water quality parameters identified in the TCEQ 303d List of Impaired Water Bodies.

6.5.1 Surface Water

Key surface water parameters identified within the LCRWPA fall into two (2) broad categories:

1. Nutrients and Non-Conservative Substances

- Bacteria
- pH
- Dissolved Oxygen
- Total Suspended Solids (TSS)
- Temperature
- Nutrients (nitrogen, phosphorus)
- Minerals and Conservative Substances
- Total Dissolved Solids (TDS)
- Chlorides
- Mercury
- Salinity
- Sediment Contaminants

Non-conservative substances are those parameters that undergo rapid degradation or change as the substance flows downstream, such as nutrients which are consumed by plant life. Nutrients and non-conservative loadings to surface water originate from a variety of natural and man-made sources. One (1) significant source of these loads is wastewater treatment facilities. As population increases, the number and size of these wastewater discharges will likely increase. Stormwater runoff from certain land use types constitutes another significant source of nutrient loading to the Region's watercourses, including such land use types as agricultural areas, golf courses, residential development, or other landscaped areas where fertilizers are applied. Nutrient loads in the LCRWPA are typically within the limits deemed acceptable for conventional water treatment facilities and are, therefore, not considered a major concern as related to source of supply.

2. Conservative Substances

Conservative substances are those that do not undergo rapid degradation or do not significantly change in the water as the substance flows downstream, such as metals. Minerals and other conservative substances contributing to surface water generally originate from three (3) sources: (1) non-point source runoff or groundwater seepage from mineralized areas, either natural or man-made, (2) wastewater discharges, and (3) sea water migration above estuaries. Wastewater discharges and industrial discharges have improved over the past 30 years due to the requirements of the Clean Water Act. If local concentrations of conservative contaminants are identified, they are remediated by the appropriate agency. Natural features such as elevation tend to limit salinity migration above estuaries.

6.5.2 Groundwater

Groundwater in the LCRWPA is generally of good quality. Water quality parameters of interest include TDS, metals, and hardness.

Groundwater in the Gulf Coast aquifer containing less than 500 mg/L dissolved solids is located at various depths throughout the lower three (3) Counties, but at no depths greater than 3,200 feet. The Carrizo-Wilcox aquifer has localized areas of water quality problems which include hydrogen sulfide, methane, increased salinity levels, and dissolved solids. The Edwards aquifer is typically fresh, although hard, with dissolved solids concentrations typically less than 500 mg/L.

Water quality from the Trinity aquifer is acceptable for most municipal and industrial purposes; however, excess concentrations of certain constituents in many places exceed drinking water standards. Heavy pumpage and water level declines in this Region have contributed to deteriorating water quality in the aquifer.

Wells completed in the Middle Trinity aquifer (especially the Hensell Sand) may exhibit levels of sodium, sulfate, and chloride, which are believed to be the result of leakage from the overlying Glen Rose Formation. This is less likely to be true for wells completed in the Lower Trinity aquifer. The Hammett Shale acts as an aquitard and effectively prevents leakage from the overlying formations. In some areas, poor quality water occurs in and near wells that have not been properly cased. These wells may have deteriorated casings, insufficient casing or cement, or the casing may have been perforated at multiple depths in an effort to maximize the well yield. These wells serve as a conduit for poor quality water originating in the evaporite beds near the contact of the Upper and Lower Glen Rose Formations. Water quality declines in the down-dip direction of all of the Trinity aquifer water-bearing units.

Natural chemical quality of Edwards-Trinity (Plateau) water ranges from fresh to slightly saline. The water is typically hard and may vary widely in concentrations of dissolved solids, composed mostly of calcium and bicarbonate. The salinity of the groundwater tends to increase toward the west. Water quality of springs issuing from the aquifer in the southern and eastern border areas is typically excellent.

In general, the quality of water from the Hickory aquifer could be described as moderate to low quality. The TDS concentrations vary from 300 to 500 mg/L. In some areas the groundwater may have dissolved solids concentrations as high as 3,000 mg/L. The water may contain alpha particle and total radium concentrations that may exceed the safe drinking water levels of the U.S. Environmental Protection Agency (EPA) and TCEQ. Radon gas may also be entrained, although no limits have been established for radon. Most of the radioactive groundwater is thought to be produced from the middle Hickory unit, while the upper Hickory unit produces water that exceeds secondary limits for concentration of iron. High nitrate levels may be found in the shallower portions of the aquifer where there may be interaction with surface activities such as fertilizer applications and septic systems.

Throughout most of the LCRWPA, the chemical quality of the Queen City aquifer water is excellent, but water quality may deteriorate fairly rapidly down-dip. The water may be fairly acidic (low pH), have high iron concentrations, or contain hydrogen sulfide gas. All of these conditions are relatively easy to remedy with standard water treatment methods.

Usable quality water is commonly found within the Sparta aquifer outcrop and for a few miles down-dip. The water quality in most of this aquifer is excellent, but the quality does decrease in the down-dip direction. In some areas, the water can contain iron concentrations exceeding the secondary drinking water standards.

Water produced from the Ellenburger-San Saba aquifer may have dissolved concentrations that range from 200 mg/L to as high as 3,000 mg/L, but in most cases is usually less than 1,000 mg/L. The quality of water declines rapidly in the down-dip direction. In addition, portions overlying the Hickory Aquifer may be susceptible to radium entering from the Hickory Aquifer through faults.

The water produced from the Marble Falls aquifer is suitable for most purposes, but some wells in Blanco County have produced water with high nitrate concentrations. The down-dip portion of the aquifer is not extensive, but in these areas, the water becomes highly mineralized. Since the limestone formation comprising this aquifer is relatively shallow, it is susceptible to pollution by surface uses and activities. In addition, portions overlying the Hickory Aquifer may be susceptible to radium entering from the Hickory Aquifer through faults.

Water quality in the Yegua-Jackson aquifer varies greatly. Water produced from the Yegua-Jackson aquifer may have dissolved concentrations as high as 3,000 mg/L. Chlorides and sulfates are also a concern for this aquifer, as well as some areas of high concentrations of dissolved manganese. In general, small amounts of usable water can be found at less than 300 feet deep throughout most of the aquifer.

6.5.3 Brackish Groundwater

Total dissolved solids (TDS) is the most commonly used parameter to describe overall groundwater quality because it is a measure of all of the dissolved constituents in water. In this section of the RWP, TDS will be used as the general description of groundwater quality. The term "brackish", as used in this section of the RWP, describes slightly-saline or moderately-saline groundwater and thus includes water between 1,000 and 10,000 mg/L TDS.

Many water-bearing formations in Texas contain a large volume of brackish groundwater. Discussions on brackish groundwater in Region K are based on information found in "*Brackish Groundwater Manual for Texas Regional Planning Groups*", prepared for the Texas Water Development Board (TWDB) in February 2003.

Historically, the TWDB has defined aquifer water quality in terms of TDS concentrations expressed in milligrams per liter (mg/L) and has classified water into four (4) broad categories; fresh (less than 1,000 mg/L), slightly-saline (1,000 - 3,000 mg/L), moderately-saline (3,000 - 10,000 mg/L), and very-saline (10,000 - 35,000 mg/L).

Official TWDB delineations of the down-dip boundaries of aquifers such as the Edwards (BFZ), Trinity, Queen City, Sparta, and Carrizo-Wilcox have historically been based on water quality, specifically the TDS concentrations that meet the needs of the aquifers' primary uses. The down-dip extent of most aquifers in the state is defined by the 3,000 mg/L dissolved solids level, as groundwater with less than 3,000 mg/L TDS meets most agricultural and industrial needs. However, a few aquifers have different TDS criteria defining the aquifer extent, including: Edwards (BFZ) (1,000 mg/L TDS).

The availability of brackish groundwater is a general measure of the amount of brackish groundwater in a water-bearing unit. All of the major and minor aquifers in the Region K water planning area contain brackish groundwater, which are listed below:

Major Aquifers

- Carrizo-Wilcox
- Edwards (BFZ)
- Edwards-Trinity (Plateau)
- Trinity
- Gulf Coast

Minor Aquifers

- Ellenburger-San Saba
- Hickory

- Marble Falls
- Queen City
- Sparta
- Yegua-Jackson

6.5.3.1 Carrizo-Wilcox Aquifer

The Carrizo-Wilcox aquifer is one of the most continuous and permeable water-bearing formations in Texas. In the LCRWPA, it extends into Bastrop and Fayette Counties. Throughout the extent of the aquifer, it provides groundwater acceptable for most irrigation, public supply and industrial purposes. It also has significant brackish water resources in down-dip portions of the aquifer that may be used as additional water supplies.

In Central Texas groundwater from the Carrizo is principally sodium chloride and sodium sulfate types. The availability of brackish groundwater from the Carrizo-Wilcox aquifer in Region K is considered high.[2]

6.5.3.2 Edwards (BFZ) Aquifer

The Edwards (Balcones Fault Zone-BFZ) aquifer extends in Travis and Hays Counties in Region K. The boundary between the fresh-water and brackish sections of the Edwards aquifer is commonly referred to as the “Bad Water Line”, which is the 1,000 mg/L TDS line.

Groundwater in the fresh portion of the Edwards is a hard, calcium-bicarbonate water. As the salinity of the water increases in the saline portion of the aquifer, the concentrations of sulfate and chloride increase, as does the concentration of sodium, and the water becomes a sodium-mixed anion type water. The quality of the saline water in the Edwards aquifer does not appear to vary significantly areally. In general, poorer quality water in the aquifer is found in the down-dip portions of the aquifer and may also correlate with low permeability sections of the formations. Similarly, there are no consistent vertical trends in water quality. In places, wells produce fresh water at shallow depths, brackish to saline water at greater depths, and fresh water again at even greater depths. Hydrogen sulfide is often found in the Saline Zone.

Availability of brackish groundwater from Edwards (BFZ) aquifer in Region K is low to moderate.[3] According to the Barton Springs/Edwards Aquifer Conservation District (BS/EACD), *BS/EACD Report of Investigations 2017-1015*, water sampled from the saline part of Edwards Aquifer in Southeast Travis County ranged from 8,877 mg/L to 18,622 mg/L. Per the same report, “estimates indicate relatively high-yielding wells are possible in the Saline Edwards, with yields greater than 1,000 gpm,” indicating that Edwards Aquifer Saline Zone is favorable for extraction.

6.5.3.3 Edwards-Trinity (Plateau) Aquifer

Much of the groundwater found in the Edwards-Trinity (Plateau) aquifer is fresh to slightly-saline. The chemical quality of the Edwards and associated limestones is generally better than that in the underlying Trinity aquifer in the Plateau region. Groundwater is fairly uniform in quality, with water from the Edwards

[2] “*Brackish Groundwater Manual for Texas Regional Planning Groups*”, prepared for TWDB by LBG-Guyton Associates in association with NRS Consulting Engineers, February, 2003.

and associated limestones being a very hard, calcium bicarbonate type, usually containing less than 500 mg/L TDS, although in some areas the TDS can exceed 1,000 mg/L. The water quality in the Trinity tends to be poorer than in the Edwards.

There is no availability of brackish groundwater from Edwards Trinity (Plateau) aquifer in Region K. [3]

6.5.3.4 Trinity Aquifer

Trinity Group deposits include sands, limestones, shales and clays. The stratigraphy of the Trinity Group is complicated, in part because of the large area that it covers.

In Central Texas, the Hensell and Hosston Sands are the most productive units in the Trinity aquifer. The Hensell is fairly prolific in many areas and is known to yield small to large amounts of water to wells. It is also referred to as the “First” or “Upper” Trinity Sand by drillers and locals in Central Texas.

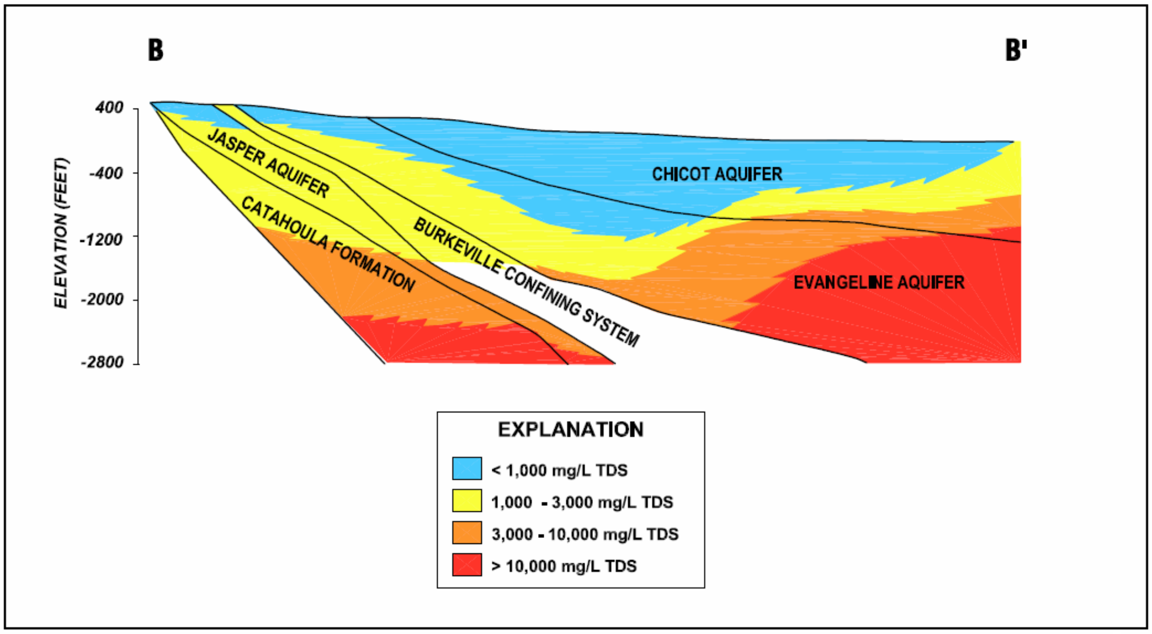
A significant source of brackish water may be found in the down-dip areas of the Trinity aquifer. The availability of brackish groundwater from the Trinity aquifer in most of Region K is considered moderate.

6.5.3.5 Gulf Coast Aquifer

The Gulf Coast aquifer extends through a large area of Region K in Fayette, Colorado, Wharton and Matagorda counties.

Water quality varies with depth and locality in the Gulf Coast aquifer. The water quality is generally fresh in the northeastern half of the aquifer, from the Coastal Bend region to Louisiana. Some areas in this half do produce slightly-saline water, in particular near the coast between the City of Houston and Louisiana. The groundwater quality in the southwestern half of the aquifer (generally south of the San Antonio River) is generally more brackish than in the northern section, with most areas containing slightly- to moderately-saline groundwater, and very few areas containing fresh water. The depths that fresh, slightly-saline, moderately-saline, and saline groundwater is found varies from individual aquifer to aquifer throughout the extent of the aquifer system. *Figure 6.1* shows concentrations of total dissolved solids in the Gulf Coast aquifer in a cross-section running through Lavaca, Wharton, and Matagorda Counties.[2]

Figure 6.1: Simplified Cross-Section of the Gulf Coast Aquifer System running through Lavaca, Wharton, and Matagorda Counties



SIMPLIFIED CROSS SECTION B-B' OF THE GULF COAST AQUIFER SYSTEM WITH GENERALIZED WATER QUALITY RANGES
(Modified from Baker, 1979)

The availability of brackish groundwater from the Gulf Coast aquifer in most of Region K is considered moderate to high.[2]

6.5.4 Other Aquifer Water Quality Information

While the Groundwater Availability Model (GAM) reports may contain information pertaining to water quality of aquifer formations, the models do not provide any outcomes concerning water quality issues.

TWDB's water well database tracks concentration of several water quality constituents including Sodium, Potassium, Strontium, Bicarbonates, Sulfate, Chloride, Fluorides, Nitrates, Alkalinity, and Hardness.

6.5.5 Potential Water Quality Impacts Resulting from Increased Drawdown of Aquifers

The potential water quality impacts resulting from increased drawdown in the LCRWPA are currently not well understood. The following is a discussion of potential water quality issues:

The wells close to the coast have greater risk to be impacted. As they are drawn down, there is a greater potential for salt water intrusion which begins to increase the total dissolved solids in the water. Overall, water quality has been good throughout the lower counties, and they have experienced higher demands and lower water tables in the past than what is currently projected under this RWP.

Concerns for most of the Central Texas aquifers are largely based on limiting or ceasing spring flows rather than quality reasons. With the lack of current knowledge on the locations of the potential salt deposits, it can be stated that increased drawdown could, in some cases, result in deteriorated water quality associated with total dissolved solids and radiation in some areas.

6.5.6 Management Strategies

The Lower Colorado River Authority (LCRA) has implemented regulatory programs within their jurisdiction to aid in pollution prevention. LCRA regulations include both land-based activities and surface water usage. Land-based activities include on-site sewage facilities, septic systems, construction, and nonpoint source pollution. In addition, LCRA has supported the “no discharge” designation by TCEQ for the Highland Lakes. The water quality parameters and water management strategies selected by the LCRWPG were evaluated to determine the impacts on water quality as a result of these recommended strategies. The recommended management strategies (and categories of strategies), as described in *Chapter 5* of this RWP and used in this evaluation, are:

- Water Conservation (Municipal, Industrial, and Agricultural)
- Expansion of Current Groundwater Supplies
- Development of New Groundwater Supplies
- Water Importation
- Aquifer Storage and Recovery (ASR) and Enhanced Recharge
- Return Flows / Reuse and Reuse-sourced Projects
- Water Purchase/New or Amended Water Contracts
- LCRA and Austin Off-Channel Reservoirs
- LCRA Water Management Plan for Interruptible Supplies
- Desalination of Brackish Groundwater
- Blending tidally-influenced water in the STPNOC reservoir
- Alternate Canal Delivery

The following paragraphs discuss the impacts of each management strategy on the chosen water quality parameters.

<u>Water Conservation</u>, including municipal and industrial, can have both positive and negative impacts on water quality. Water that is being processed through a wastewater treatment plant typically has acquired additional dissolved solids prior to discharge to the waters of the state. Conventional wastewater treatment reduces suspended solids but does not reduce dissolved solids in the effluent. Water conservation measures will reduce the volume of water passing through the wastewater plants without reducing the mass loading rates (a 1.6-gallon flush carries the same waste mass to the wastewater plant that a 6-gallon flush once carried). This may result in increased constituent loads to the wastewater treatment plants. In the event that, over time, water conservation causes changes to wastewater concentrations, treatment processes may need to be adjusted to maintain permitted discharge parameters. It should be noted that during low flow conditions, the wastewater effluent in a stream may represent water that helps to augment and maintain the minimum stream flows.

Conservation of irrigation water (through on-farm water conservation measures, irrigation district conveyance improvements, and conversion to sprinkler irrigation), pump limited amounts of groundwater during drought conditions, and primarily capture the remaining permitted portion of Colorado River flows. Return flows generated by runoff from rice irrigation are returned via tail water runoff in the Colorado River Basin or the coastal basin. Tail water is the term used to describe that water returned to the stream after application to irrigated cropland. Tail water may carry nutrients, sediments, salts, and other pollutants from the farmland. This return flow can have a negative impact on water quality, and by implementing conservation measures which reduce tail water losses, the nutrient and sediment loading can be reduced. However, this return flow tends to be introduced into the receiving stream during normally dry periods so it may have a net beneficial effect in terms of maintaining minimum streamflow conditions.

The impacts on water quality of the Expansion of Current Groundwater Supplies, Development of New Groundwater Supplies, and Water Importation strategies are uncertain. However, they are not expected to have adverse impacts to the water quality in the aquifer. In some particular situations, these strategies may negatively influence water quality. As previously stated, water quality in the Hickory aquifer could be described as moderate to low quality. The use of this aquifer by municipal users may require additional treatment compared to a standard groundwater treatment plant, especially in areas of high concentrations of TDS, areas that may contain alpha particle and total radium concentrations that may exceed the safe drinking water levels of the EPA and TCEQ, and areas with high nutrient levels. The use of this aquifer by irrigators could potentially release the above constituents into surface water sources, thus causing increased levels of the above described water quality parameters. Strategies using the Hickory Aquifer are recommended only for Mining WUGs in the 2021 RWP, so the quality of the water should be less of an issue.

The recommended Aquifer Storage and Recovery (ASR) and Enhanced Recharge projects in this plan utilize a variety of water sources for storage. Fresh groundwater, brackish or saline groundwater, wastewater effluent, and surface water are all sources that are identified for the various recommended strategies. The groundwater sources should have limited impacts on water quality, although storing fresh water in the Saline Zone for a long period of time can increase the TDS and decrease the quality of the stored water. Utilizing wastewater effluent and surface water that is diverted from the Colorado River could reduce instream flows downstream, which in turn, could negatively impact water quality during certain months of the year when instream flows are already lower.

Reuse and Reuse-sourced Projects are part of Austin's (Austin Water) management strategies and other utilities' water management strategies to respond to droughts and meet future growth and subsequent water supply shortages. Austin plans to use a portion of their wastewater effluent as a source for a number of recommended strategies to extend current supplies and help alleviate future shortages. Austin plans to use indirect reuse, if authorized by TCEQ, or direct reuse with infrastructure for a variety of projects. While the amount of reuse is projected to increase, municipal Return Flows from multiple water providers are also projected to increase over the planning period. In addition, a LCRA strategy to import return flows from Williamson County (Region G, Brazos Basin) to the Colorado Basin will increase instream flows even during times of drought. When available on an interruptible basis, downstream water rights can continue to divert, in seniority order, these return flows. In any event, the quality of water produced by Austin wastewater facilities is such that no adverse impacts on water quality are anticipated. In other parts of the region, direct reuse provides a purposeful use for treated wastewater effluent that cannot otherwise be discharged to the Highland Lakes, due to TCEQ restrictions. A portion of this effluent is currently being used to irrigate areas that do not normally require irrigation. In a sense, this strategy would simply relocate the treated effluent to more useful locations that are currently irrigated with potable water. Due to the treatment standards of the effluent, there should be no water quality issues from this strategy. Since the effluent is not allowed to be discharged to the Highland Lakes, there is also no issue of reduced return flows downstream.

Water Purchase and Additional Contracts as management strategies can decrease instream and bay and estuary freshwater inflows as a result of the full utilization of water supplies, although the Water Management Plan provides for environmental flows in the river below Austin and Matagorda Bay. Fully utilizing existing water supply projects may amplify some existing concerns, particularly contaminant concentrations due to reduced opportunities for instream dilution. The continued return of flows via wastewater treatment facility discharges will provide some mitigation of that effect. Typical municipal return flows are approximately 60 percent of the total quantity diverted for use, although that percentage may be expected to decrease as reuse and reuse-sourced projects develop.

LCRA and Austin Off-Channel Reservoirs potentially will have a positive impact on water quality since one or more will operate partially or wholly as a “scalping reservoir” such that diversions are made to the reservoir only when flows in the river are sufficient to meet higher priority need. The water that is diverted using existing water rights and stored in reservoirs would allow some sediments to settle out, so that water released from the reservoir would be of higher quality. The water would be stored for consumptive use during times of low or no run-of-river availability. Instream flows along with bay and estuary freshwater inflows would slightly decrease during wetter times when the reservoirs are refilled.

LCRA Water Management Plan allows LCRA to supply rice irrigators in the Lower Colorado River Basin with interruptible supplies of water from the Highland Lakes, when available. Releases from storage provide streamflow in the river on the way to the diversion point, with impacts to water quality that are similar to return flows.

Desalination of Brackish Groundwater, such as the Edwards-BFZ Saline Zone and the Trinity Aquifer, will provide a usable water supply with a level of dissolved solids low enough to be used for municipal purposes. A significant side effect of this strategy is the disposal of wastes generated from the desalination process. If deep well injection is used for brine disposal, minimal impacts to water quality should occur.

Blending tidally-influenced water in the STPNOC reservoir will increase the TDS levels in the reservoir. As long as there is sufficient freshwater in the reservoir, the TDS levels should remain low enough to be used for steam-electric power generation. No desalination process should be necessary.

Alternate Canal Delivery by STPNOC will decrease the TDS levels in the STPNOC reservoir by allowing for water diversions with lower TDS to dilute the TDS of the water in the STPNOC cooling pond

6.6 IMPACTS OF WATER MANAGEMENT STRATEGIES ON NAVIGATION

The overall impact on navigation in Region K is negligible in the area of the Colorado River and Matagorda Bay that is tidally influenced. This is the area where the most shipping occurs, and navigation will be least affected in this zone. Once beyond the tidally influenced areas, the overall impact of the management strategies will be to reduce the amount of currently available interruptible water supplies as the current WUGs increase in demand over time through growth in population. However, the current LCRA Water Management Plan calls for a release of up to 33,440 ac-ft. Navigation on the Colorado upstream of the tidally influenced areas is primarily for pleasure craft, and the impact of the mandated releases under the LCRA Management Plan plus other downstream flows may provide sufficient water for navigation purposes.

6.7 SUMMARY OF UNMET IDENTIFIED WATER NEEDS

While the goal of the LCRWPG has been to recommend water management strategies to meet all water needs in the region, the 2021 Region K Plan does have some remaining unmet needs.

Irrigation water needs in Colorado County, Matagorda County, Mills County, and Wharton County were not able to be fully met by recommended strategies. *Table 6.8* provides a summary of the recommended strategies and the remaining unmet water needs as a total for the region. Remaining unmet needs range from approximately 75,000 ac-ft in 2020 to approximately 7,000 ac-ft in 2070, and incorporate surpluses that occur in some counties/basins. The limiting factors for new water management strategies that can be recommended for Irrigation are water availability and cost of new infrastructure.

Table 6.8: Recommended Strategies for Irrigation and Remaining Unmet Irrigation Needs

Water Management Strategies	2020 Needs	2030 Needs	2040 Needs	2050 Needs	2060 Needs	2070 Needs
	(254,364)	**(239,922)**	**(225,869)**	**(212,193)**	**(198,886)**	**(185,938)**
	Water Management Strategy Yield (ac-ft/yr)					
Drought Management	34,153	33,233	32,340	31,470	30,625	29,801
On-Farm Conservation	22,513	26,923	31,333	35,745	40,157	44,567
Irrigation Operations Conveyance Improvements	6,000	13,670	21,341	29,011	36,680	44,350
Sprinkler Irrigation	912	4,558	9,114	11,394	11,394	11,394
Real-Time Use Metering and Monitoring	20,509	19,955	19,420	18,897	18,389	17,895
Return Flows	17,006	16,765	16,526	16,287	16,047	15,809
Development and Expansion of Groundwater Supplies	14,760	14,760	14,760	14,760	14,760	14,760
LCRA WMP Interruptible Water (2010 WMP)	63,495	25,797	13,105	0	0	0
(Future LCRA WMP, including OCR and other supplies)	*	*	*	*	*	*
Remaining Shortage/Surplus	**(75,016)**	**(84,261)**	**(67,930)**	**(54,629)**	**(30,834)**	**(7,362)**

* Availability of interruptible water will be increased using recommended OCRs; the estimated quantity is subject to WMP amendments through TCEQ and the hydrologic outcome of the current drought.

There are also identified unmet Mining needs in the 2021 Region K Plan. These needs were identified in Bastrop County in coordination with Region G. The mining industry in that area pumps groundwater to lower the water table in order to allow access to mining activities. It was determined that the Mining demands were not true demands, and therefore did not need to have recommended water management strategies. The unmet Mining WUG needs are as follows:

Table 6.9: Unmet Mining Needs in Region K

WUG	County	Basin	Unmet Needs (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Mining	Bastrop	Colorado	(449)	(3,947)	(4,557)	(3,220)	0	0

Finally, there are also identified unmet Steam-electric needs in the 2021 Region K Plan. These needs were identified in Colorado County. Based on information provided by the Colorado County Groundwater Conservation District, the demand projections the needs are based on are not accurate. One steam-electric facility has no plan for construction, and the other facility has no consumptive use. Therefore, no supplies were allocated to the demands, and the resulting needs are not a true water shortage. No water management strategies have been recommended, and the demands in this county will be corrected in the next regional water plan. The unmet Steam-electric WUG needs are as follows:

Table 6.10: Unmet Steam-Electric Needs in Region K

WUG	County	Basin	Unmet Needs (ac-ft/yr)					
			2020	2030	2040	2050	2060	2070
Steam-Electric	Colorado	Colorado	(4,971)	(4,971)	(4,971)	(4,971)	(4,971)	(4,971)

APPENDIX 6A

ENVIRONMENTAL IMPACT ANALYSIS OF CUMULATIVE STRATEGIES INCLUDING SEPARATE RETURN FLOWS RUN

6A.1

Frequency Attainment of TCEQ Environmental Flow Standards for Freshwater Inflows to Matagorda Bay Including Separate Strategy Run Showing Just the Return Flow Strategies

SPRINGTIME ONSET FLOW CRITERIA MET (3 CONSECUTIVE MONTHS DURING JAN-MAY)								
		Base		Water Management Strategy Runs				DIFFERENCE Base vs All Strategies
CRITERIA	TARGET			Return Flows Only [1]		All Strategies [2]		
	(AC-FT)	#YEARS	%	#YEARS	%	#YEARS	%	%
MBHE 1	114,000	51	66.2%	52	67.5%	51	66.2%	0.0%
MBHE 2	168,700	46	59.7%	50	64.9%	47	61.0%	1.3%
MBHE 3	246,200	43	55.8%	47	61.0%	44	57.1%	1.3%
MBHE 4	433,200	31	40.3%	33	42.9%	34	44.2%	3.9%

FALL ONSET FLOW CRITERIA MET (3 CONSECUTIVE MONTHS DURING AUG-OCT)								
		Base		Water Management Strategy Runs				DIFFERENCE Base vs All Strategies
CRITERIA	TARGET			Return Flows Only [1]		All Strategies [2]		
	(AC-FT)	#YEARS	%	#YEARS	%	#YEARS	%	%
MBHE 1	81,000	56	72.7%	58	75.3%	54	70.1%	-2.6%
MBHE 2	119,900	51	66.2%	52	67.5%	51	66.2%	0.0%
MBHE 3	175,000	46	59.7%	49	63.6%	46	59.7%	0.0%
MBHE 4	307,800	41	53.2%	42	54.5%	41	53.2%	0.0%

INTERVENING SIX MONTHS FLOW CRITERIA MET								
		Base		Water Management Strategy Runs				DIFFERENCE Base vs All Strategies
CRITERIA	TARGET			Return Flows Only [1]		All Strategies [2]		
	(AC-FT)	#YEARS	%	#YEARS	%	#YEARS	%	%
MBHE 1	105,000	52	67.5%	53	68.8%	52	67.5%	0.0%
MBHE 2	155,400	46	59.7%	51	66.2%	49	63.6%	3.9%
MBHE 3	226,800	45	58.4%	48	62.3%	46	59.7%	1.3%
MBHE 4	399,000	34	44.2%	36	46.8%	34	44.2%	0.0%

NUMBER OF MONTHS THAT THRESHOLD LEVEL IS MET								
		Base		Water Management Strategy Runs				DIFFERENCE Base vs All Strategies
CRITERIA	TARGET			Return Flows Only [1]		All Strategies [2]		
	(AC-FT/mo)	#MONTHS	%	#MONTHS	%	#MONTHS	%	%
THRESHOLD	15,000	584	63.2%	632	68.4%	631	68.3%	5.1%

[1] Return Flows Only includes the following strategies: Austin Return Flows, Downstream Return Flows (Pflugerville), and Import Return Flows from Williamson County

[2] All Strategies includes the following strategies: Austin Return Flows, Downstream Return Flows (Pflugerville), and Import Return Flows from Williamson County, Austin Off-Channel Reservoir, Austin Aquifer Storage and Recovery (ASR), LCRA Enhanced Recharge (MAR), LCRA Aquifer Storage and Recovery (ASR), LCRA Excess Flows Off-Channel Reservoir, LCRA Mid-Basin Off-Channel Reservoir, and Baylor Creek Reservoir

6A.2 Frequency Attainment of TCEQ Environmental Flow Standards for Colorado River Instream Flows Including Separate Strategy Run Showing Just the Return Flow Strategies

	TARGET ATTAINMENT FREQUENCY 100%					TARGET ATTAINMENT FREQUENCY 80%					TARGET ATTAINMENT FREQUENCY 60%				
	SUBSISTENCE FLOWS					BASE FLOWS - DRY CONDITIONS					BASE FLOWS - AVERAGE CONDITIONS				
		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies
MONTH	FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]	
	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%
Jan	12,786	100.0%	100.0%	93.5%	-6.5%	19,241	85.7%	97.4%	87.0%	1.3%	26,618	53.2%	79.2%	68.8%	15.6%
Feb	15,349	90.9%	100.0%	92.2%	1.3%	17,758	81.8%	93.5%	88.3%	6.5%	27,842	46.8%	66.2%	57.1%	10.4%
Mar	16,844	100.0%	100.0%	96.1%	-3.9%	16,844	100.0%	100.0%	96.1%	-3.9%	30,552	51.9%	67.5%	68.8%	16.9%
Apr	10,946	100.0%	100.0%	98.7%	-1.3%	17,074	94.8%	98.7%	98.7%	3.9%	37,776	51.9%	72.7%	74.0%	22.1%
May	16,905	100.0%	100.0%	98.7%	-1.3%	35,593	79.2%	88.3%	87.0%	7.8%	50,654	62.3%	67.5%	64.9%	2.6%
Jun	12,017	100.0%	100.0%	100.0%	0.0%	24,867	97.4%	98.7%	100.0%	2.6%	43,606	80.5%	92.2%	92.2%	11.7%
Jul	8,422	100.0%	100.0%	100.0%	0.0%	21,331	97.4%	100.0%	100.0%	2.6%	37,499	74.0%	90.9%	94.8%	20.8%
Aug	7,561	100.0%	100.0%	100.0%	0.0%	11,926	100.0%	100.0%	100.0%	0.0%	23,421	85.7%	98.7%	100.0%	14.3%
Sep	7,317	100.0%	100.0%	100.0%	0.0%	14,040	100.0%	100.0%	100.0%	0.0%	25,164	84.4%	96.1%	97.4%	13.0%
Oct	7,807	100.0%	100.0%	100.0%	0.0%	15,061	89.6%	100.0%	100.0%	10.4%	26,618	58.4%	76.6%	83.1%	24.7%
Nov	10,708	98.7%	100.0%	98.7%	0.0%	16,836	67.5%	100.0%	94.8%	27.3%	25,224	48.1%	64.9%	66.2%	18.2%
Dec	11,434	97.4%	100.0%	100.0%	2.6%	19,118	67.5%	90.9%	94.8%	27.3%	27,663	45.5%	63.6%	64.9%	19.5%
Non-Attainment		3	0	6			3	0	0			7	0	1	

	SUBSISTENCE FLOWS					BASE FLOWS - DRY CONDITIONS					BASE FLOWS - AVERAGE CONDITIONS				
		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies
MONTH	FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]	
	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%
Jan	20,901	100.0%	100.0%	100.0%	0.0%	29,937	72.7%	81.8%	74.0%	1.3%	50,900	44.2%	58.4%	46.8%	2.6%
Feb	21,007	85.7%	90.9%	88.3%	2.6%	33,052	66.2%	71.4%	68.8%	2.6%	50,138	44.2%	51.9%	45.5%	1.3%
Mar	23,052	100.0%	100.0%	100.0%	0.0%	32,273	62.3%	71.4%	67.5%	5.2%	62,702	40.3%	46.8%	41.6%	1.3%
Apr	17,788	100.0%	100.0%	100.0%	0.0%	32,957	71.4%	84.4%	83.1%	11.7%	58,122	48.1%	48.1%	48.1%	0.0%
May	26,126	100.0%	100.0%	100.0%	0.0%	59,383	67.5%	74.0%	72.7%	5.2%	80,898	48.1%	53.2%	51.9%	3.9%
Jun	31,768	98.7%	100.0%	100.0%	1.3%	57,527	74.0%	80.5%	77.9%	3.9%	85,666	42.9%	48.1%	42.9%	0.0%
Jul	21,024	100.0%	100.0%	100.0%	0.0%	35,040	75.3%	92.2%	89.6%	14.3%	55,018	50.6%	58.4%	57.1%	6.5%
Aug	11,680	100.0%	100.0%	100.0%	0.0%	19,057	94.8%	100.0%	100.0%	5.2%	31,720	59.7%	79.2%	76.6%	16.9%
Sep	16,598	100.0%	100.0%	100.0%	0.0%	24,093	90.9%	98.7%	98.7%	7.8%	36,289	63.6%	80.5%	72.7%	9.1%
Oct	11,680	98.7%	100.0%	100.0%	1.3%	21,884	79.2%	94.8%	94.8%	15.6%	45,551	54.5%	55.8%	55.8%	1.3%
Nov	12,017	97.4%	100.0%	100.0%	2.6%	28,555	58.4%	70.1%	67.5%	9.1%	44,915	42.9%	49.4%	49.4%	6.5%
Dec	18,503	96.1%	100.0%	100.0%	3.9%	28,523	55.8%	76.6%	75.3%	19.5%	45,306	40.3%	46.8%	50.6%	10.4%
Non-Attainment		5	1	1			10	5	7			11	10	10	

	SUBSISTENCE FLOWS					BASE FLOWS - DRY CONDITIONS					BASE FLOWS - AVERAGE CONDITIONS				
		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies		Base	Water Management Strategy Runs		DIFFERENCE Base vs All Strategies
MONTH	FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]		FLOW		Return Flows Only [1]	All Strategies [2]	
	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%	(AC-FT/MO)	% TIME MET	% TIME MET	% TIME MET	%
Jan	19,364	100.0%	100.0%	100.0%	0.0%	30,245	72.7%	84.4%	80.5%	7.8%	51,514	53.2%	64.9%	55.8%	2.6%
Feb	16,974	98.7%	100.0%	98.7%	0.0%	33,444	64.9%	74.0%	71.4%	6.5%	50,754	48.1%	54.5%	49.4%	1.3%
Mar	12,540	100.0%	100.0%	100.0%	0.0%	32,642	55.8%	58.4%	59.7%	3.9%	63,686	42.9%	46.8%	44.2%	1.3%
Apr	16,062	100.0%	100.0%	100.0%	0.0%	33,374	58.4%	68.8%	67.5%	9.1%	60,144	45.5%	50.6%	50.6%	5.2%
May	18,688	100.0%	100.0%	100.0%	0.0%	60,551	51.9%	51.9%	50.6%	-1.3%	85,878	44.2%	45.5%	46.8%	2.6%
Jun	22,071	97.4%	100.0%	100.0%	2.6%	58,538	44.2%	46.8%	46.8%	2.6%	89,949	35.1%	37.7%	37.7%	2.6%
Jul	13,032	97.4%	100.0%	98.7%	1.3%	35,470	35.1%	49.4%	50.6%	15.6%	55,695	31.2%	29.9%	29.9%	-1.3%
Aug	6,578	97.4%	100.0%	100.0%	2.6%	19,303	40.3%	51.9%	58.4%	18.2%	32,089	28.6%	35.1%	37.7%	9.1%
Sep	11,184	97.4%	100.0%	100.0%	2.6%	24,391	55.8%	66.2%	68.8%	13.0%	36,705	45.5%	50.6%	49.4%	3.9%
Oct	9,037	96.1%	100.0%	100.0%	3.9%	22,130	68.8%	81.8%	80.5%	11.7%	46,043	48.1%	51.9%	53.2%	5.2%
Nov	10,292	98.7%	100.0%	100.0%	1.3%	28,912	62.3%	74.0%	72.7%	10.4%	45,450	45.5%	53.2%	53.2%	7.8%
Dec	12,418	96.1%	100.0%	100.0%	3.9%	28,892	67.5%	76.6%	74.0%	6.5%	45,859	48.1%	55.8%	54.5%	6.5%
Non-Attainment		8	0	2			12	10	10			12	11	12	

[1] Return Flows Only includes the following strategies: Austin Return Flows, Downstream Return Flows (Pflugerville), and Import Return Flows from Williamson County

[2] All Strategies includes the following strategies: Austin Return Flows, Downstream Return Flows (Pflugerville), and Import Return Flows from Williamson County, Austin Off-Channel Reservoir, Austin Aquifer Storage and Recovery (ASR), LCRA Enhanced Recharge (MAR), LCRA Aquifer Storage and Recovery (ASR), LCRA Excess Flows Off-Channel Reservoir, LCRA Mid-Basin Off-Channel Reservoir, and Baylor Creek Reservoir

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CHAPTER 7.0: DROUGHT RESPONSE INFORMATION, ACTIVITIES AND RECOMMENDATION

This chapter presents information on drought management and Drought Contingency Plans, as well as a summary of information provided by water systems in the Lower Colorado Regional Water Planning Area regarding drought management, including preparations and response throughout the Region.

Drought Definitions

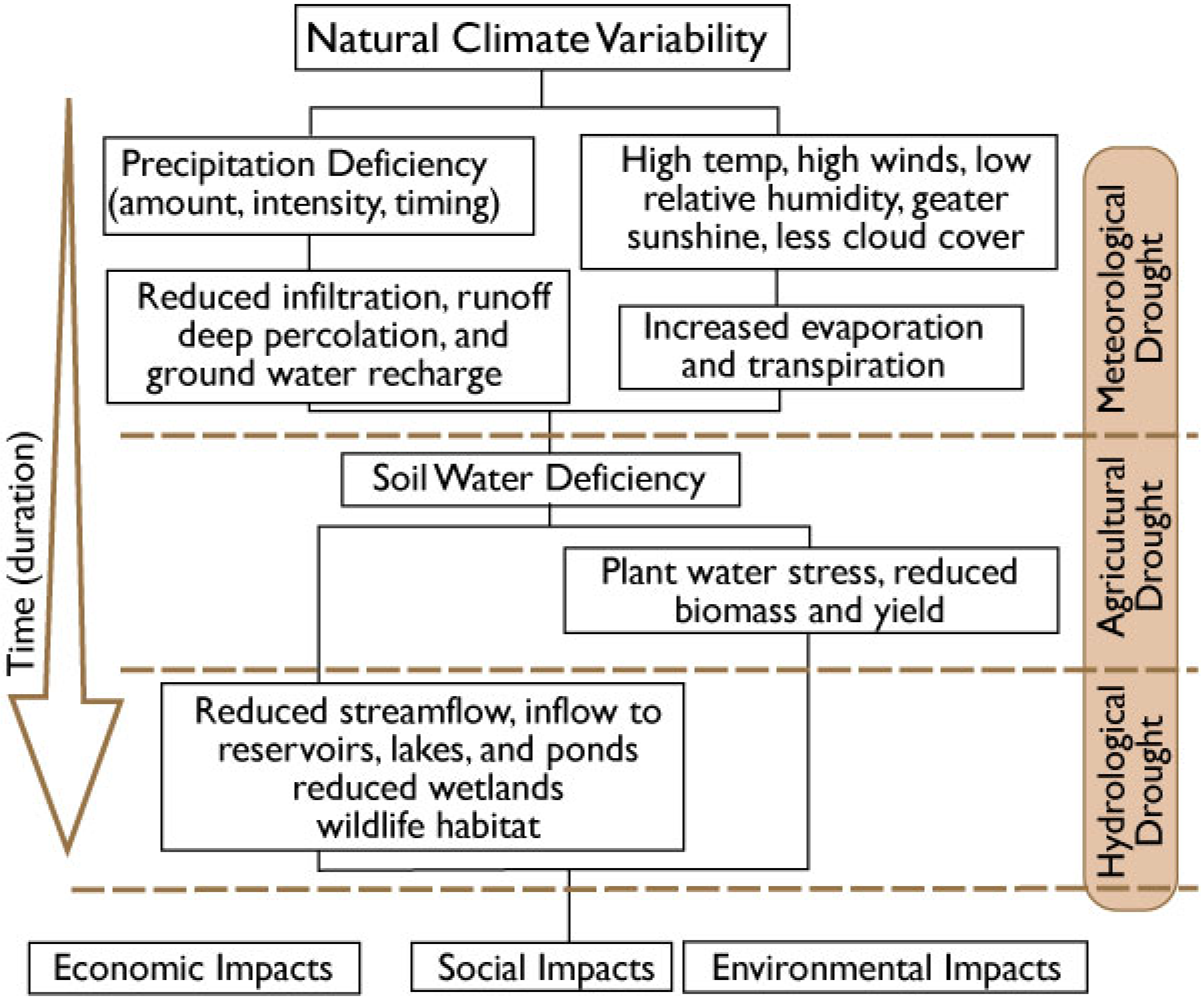
Drought is often referred to as a slow-moving emergency. The impact of droughts can be far-reaching but can be challenging to define due to the gradual and sometimes subtle progression of severity, as well as the tendency for temporal and geographic variations such as isolated rain events to shift perception of the drought severity. The types of droughts are sometimes characterized as meteorological, agricultural, and hydrological, which are events leading to the recognized socioeconomic impacts of drought. These drought terms are integrated and ordered such that as one type of drought intensifies it may lead to the development of another category of drought. The following definitions of categories of drought are taken from the State of Texas Drought Preparedness Plan and are further reflected in *Figure 7.1*:

- A meteorological drought is often defined as a period of substantially diminished precipitation duration and/or intensity that persists long enough to produce a significant hydrologic imbalance. The commonly used definition of meteorological drought is an interval of time, generally of the order of months or years, during which the actual moisture supply (typically rainfall in this region) of a given place consistently falls below the average moisture supply or average rainfall amount.
- Agricultural drought occurs when there is inadequate precipitation and/or soil moisture to sustain crop or forage production systems. The water deficit results in serious damage and economic loss to plant or animal agriculture. Agricultural drought usually begins after meteorological drought but before hydrological drought and can also affect livestock and other agricultural operations.
- Hydrological drought refers to reductions in surface and groundwater water supplies. It is measured as streamflow, and as lake, reservoir, and groundwater levels. There is usually a time lag between a lack of rain and lower amounts of measurable water in streams, lakes, and reservoirs.
- Socioeconomic drought occurs when physical water shortages start to affect the health, well- being, and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

Determining if a dry weather pattern substantiates a meteorological drought requires an area-specific analysis that is first typically signified by dry meteorological patterns. Short intervals of dry patterns are considered within the norm of meteorological variation (seasonally and annually) so it is important to note that a true meteorological drought is dependent on the area in which it occurs.

In areas where surface and/or groundwater supplies are full at the start of a dry pattern, there is often minimal impact on water use or economic and agricultural activity. However, as dry pattern intensities deepen and duration of the meteorological drought continues and water supplies are stressed, the impacts of meteorological drought transition and begin to indicate other drought categories.

Figure 7.1: Categories of Drought and Natural Climate Variability



Source: National Drought Mitigation Center website "What is Drought?"

7.1 DROUGHT OF RECORD

The definition of Drought of Record is "the period of time when historical records indicate that natural hydrological conditions would have provided the least amount of water supply," per TAC Title 31, Part 10, Chapter 357, Subchapter A, Rule 357.10.

Hydrological droughts can be assessed using the Texas Commission on Environmental Quality (TCEQ) Water Availability Model (WAM); this assessment is directly associated with the use of the WAM model to determine firm availability of surface water for the Regional Water Plan.

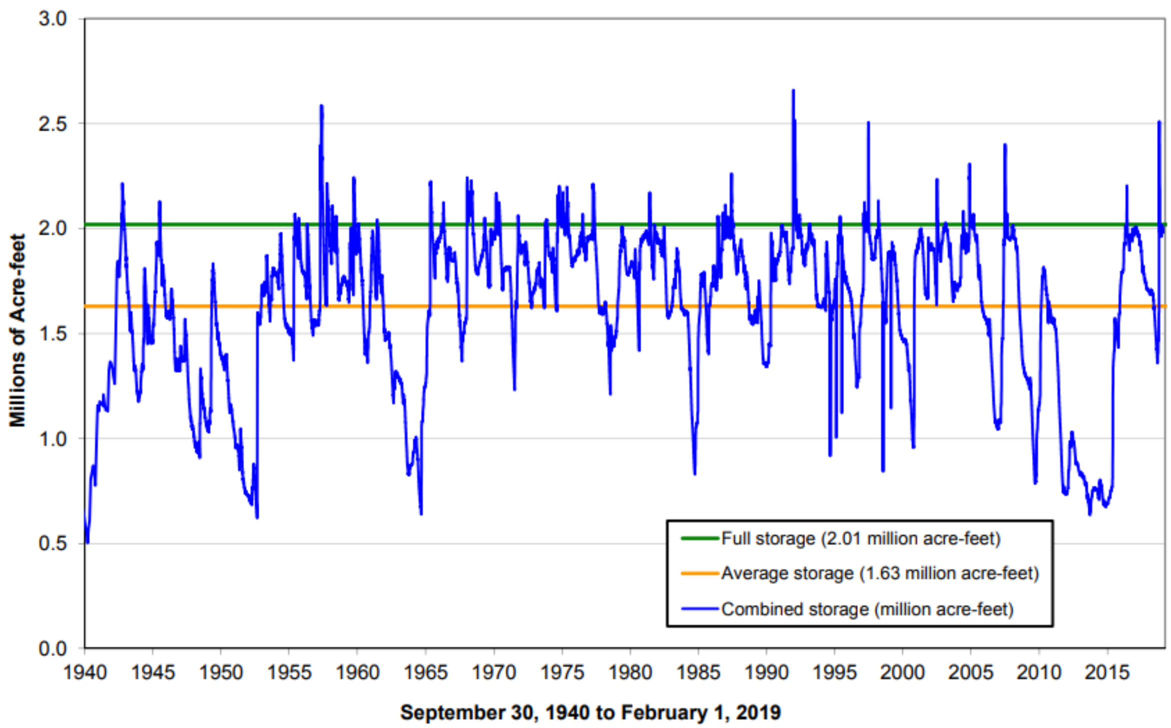
Another indicator commonly used by federal and state agencies to characterize drought severity is the Palmer Drought Severity Index (PDSI). The PDSI is an estimate of soil moisture conditions calculated based on precipitation and temperature. The PDSI classifies soil moisture on a scale ranging from approximately -6.0 to 6.0, with values of approximately -0.49 to 0.49 reflecting normal conditions and -4.0 or lower representing extreme drought.

7.1.1 Drought of Record

Statewide, the period typically considered the Drought of Record occurred in the 1950s and had significant hydrologic and economic consequences throughout the State. Within the Lower Colorado Regional Planning Area, the Drought of Record is most specifically associated with the hydrologic conditions of the Highland Lakes. The current Drought of Record for the Highland Lakes began in October 2007 and lasted through December 2016. Modeling efforts confirm that 2011 represents the worst single-year drought on record, or the dry year of the Colorado River basin. The previous Drought of Record began in May 1947 and lasted through April 1957. During this time, the Highland Lakes reached a lowest combined storage of 621,221 acre-feet on September 9, 1952.

Due to schedule requirements of the current regional plan development process, the planning group was able to extend the hydrologic data set used for the plan's surface water availability analysis through the end of 2016. However, since the full and final 2017 data sets were not yet available, analysis of any additional drought data through 2017 and beyond will need to be conducted for future planning analyses. The 5-year frequency of the regional planning cycles provides the opportunity on a regular basis to update the analyses that go into developing the plan. The 2007 to 2016 Drought of Record resulted in persistently low lake levels from 2011 to mid-2015. As of December 2019, lake storage is at 87%. *Figure 7.2* shows how the combined storage in the last several years compares to historical storage levels dating back to 1940, when the lakes were built.

Figure 7.2: Total Combined Storage Levels of Lakes Buchanan and Travis



7.2 CURRENT DROUGHT PREPARATIONS AND RESPONSE

The TCEQ, in accordance with the Texas Administrative Code (TAC), requires all wholesale public water suppliers, retail public supplier, and irrigation districts to prepare and submit Drought Contingency Plans (DCPs) meeting the requirements of 30 TAC Chapter§288(b) and to update these plans at least every five years.

While drought may be considered an emergency, it is often a slowly developing situation that provides increasing signs that water supplies could become scarce. By contrast, some supply deficiencies, such as equipment or pipeline failures, happen on shorter time intervals and provide little or no advance warning. System limitations that result from unexpected events including equipment failures, water supply contaminations, and other sudden decrease of supply should be planned for just as other emergency events. It is also important for communities to be aware that loss of supply may be a result of intentional damage or attack on a system.

The recent drought provided many water systems in the region with the opportunity to experience implementation of their Drought Contingency Plans. That real-world experience has helped shaped updates to their Drought Continency Plans. Outdoor watering restrictions are a common method of reducing water use and are now being suggested as voluntary measures for several months a year in various water systems in the region. This effort prepares customers for anticipated water restrictions during periods of drought.

The Drought Contingency Plans show that a variety of triggers have been specified by the different water suppliers as initiators of water shortage conditions. These triggers include a threshold level of total water use, well levels, and conditions caused by mechanical failure of water service systems. Strategies planned for dealing with drought conditions included restrictions on water use for irrigation, vehicle washing, and construction. The amount of water saved for each drought response conditions varied by community.

Appendix 7A provides the drought triggers for severe and critical/emergency water shortages for water users in the region, as available from the Drought Contingency Plans. The water reduction goals for the triggers are also included.

7.3 EXISTING AND POTENTIAL EMERGENCY INTERCONNECTS

The Texas Administrative Code (31 TAC 357.42(d)) states that the regional water planning groups will collect confidential information on infrastructure and submit the information to the Executive Administrator of the Texas Water Development Board in accordance with the guidance provided.

The guidance provided by the Texas Water Development Board states that "RWPGs shall collect and summarize information on existing major water infrastructure facilities that may be used for emergency interconnects and provide this information to the EA confidentially and separately from the final adopted RWP… This information may be collected in a tabular format that shows the potential user(s) of the interconnect(s), the potential supplier(s), the estimated potential volume of supply that could be provided via the interconnect (including the source name), and a general description of the facility/infrastructure and its location."

During the previous planning cycle, the Region K Drought Committee determined that a low number of responses would be expected if the planning group sent a letter requesting emergency interconnect data. Instead of a letter/survey, the Region K consultant submitted an information request to the TCEQ for information on emergency interconnects within the counties in Region K. After repeating the process for the new cycle, the TCEQ provided an Excel spreadsheet containing data on the potential user of the interconnect, the potential supplier, source information, and contact information. Information on existing and potential interconnect supply capacity and details related to location were not available. The confidential information was provided electronically, along with a transmittal letter, to the Executive Administrator prior to March 1, 2020.

Additionally, available DCPs for entities within the Region were reviewed to identify establishment or activation of interconnects as a drought response. The following entities have Drought Contingency Plans that mention the possibility of establishing or activating emergency interconnects as a drought response: Brookesmith SUD, Creedmoor-Maha WSC, Deer Creek Ranch, Fayette County WCID Monument Hill, Hays, Horseshoe Bay, Hurst Creek MUD, Lago Vista, Lakeway MUD, Leander, Travis County MUD 10, and Travis County WCID 17.

7.4 EMERGENCY RESPONSES TO LOCAL DROUGHT CONDITIONS OR LOSS OF MUNICIPAL SUPPLY

Emergency preparedness is of particular importance for entities that rely on a sole-source of water for supply purposes. In instances where water systems rely exclusively on a single source, the State of Texas has identified a need to develop emergency preparedness protocols should a source's availability be significantly and suddenly reduced for any reason, including drought, equipment failure, or accidental or deliberate source contamination.

7.4.1 WUGs with 2010 Population less than 7,500 and with a sole-source of water[1]

The Texas Administrative Code (31 TAC §357.42) requires that regional planning groups evaluate potential emergency responses to drought conditions or loss of existing water supplies for municipal water user groups with a population of less than 7,500 and with a sole-source of water, as well as all county-other water user groups.

A list of identified single-source municipal Water User Groups with population less than 7,500 and with a sole-source of water is provided in *Table 7.1* on the next page. The table also lists potential emergency water supply options for each Water User Group.

7.4.2 County-Other WUGs

Table 7.2 on the following pages provides the list of County-Other Water User Groups in Region K, and their potential emergency water supply options.

[1] Information in this subsection was obtained from the Texas Administrative Code, specifically TAC Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.2.0

Table 7.1: Municipal Region K WUGs under 7,500 in population and with a sole-source of water

Entity					**Potential Emergency Water Supply Source(s)**								**Implementation Requirements**				
Water User Group Name	County	2020 Population	2020 Demand (AF/ year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Barton Creek West WSC	Travis	1,337	436	Highland Lakes						X		X	1	A		unk	
Barton Creek WSC	Travis	702	524	Highland Lakes			X					X	2				
Boling MWD	Wharton	855	105	Gulf Coast Aquifer			X					X	2				
Briarcliff	Travis	2,009	300	Highland Lakes								X					
Caney Creek MUD of Matagorda County	Matagorda	2,088	252	Gulf Coast Aquifer			X					X	2				
Cimarron Park Water Company	Hays	2,115	244	Edwards-BFZ			X					X	2				
Columbus	Colorado	3,832	1,134	Gulf Coast Aquifer	X		X					X	2,3				
Cottonwood Creek MUD 1	Travis	1,447	95	Carrizo-Wilcox			X					X	2				
Cottonwood Shores	Burnet	1,395	245	Highland Lakes			X			X		X	1,2	B		unk	
Deer Creek Ranch Water	Travis/ Hays	887	69	Highland Lakes			X					X	2				
Eagle Lake	Colorado	3,803	521	Gulf Coast Aquifer			X					X	2				
Fayette County WCID Monument Hill	Fayette	760	184	Gulf Coast Aquifer			X			X		X	2	P			
Flatonia	Fayette	1,658	346	Yegua-Jackson			X					X	2				

Entity					Potential Emergency Water Supply Source(s)								Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/ year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Garfield WSC	Travis	1,772	199	Trinity Aquifer			X					X	2				
Granite Shoals	Burnet	5,401	578	Highland Lakes			X			X		X	1,2	C		unk	
Hays	Hays	1,222	183	Edwards-BFZ			X			X		X	1	O		unk	
Hays County WCID 1	Hays	3,647	821	Highland Lakes			X					X	2				
Hays County WCID 2	Hays	1,224	285	Highland Lakes			X					X	2				
Hornsby Bend Utility	Travis	7,066	594	Carrizo-Wilcox			X					X	2				
Horseshoe Bay	Burnet/ Llano	6,125	2,268	Highland Lakes/Direct Reuse			X			X		X	1,2	D		unk	
Hurst Creek MUD	Travis	3,095	1,718	Highland Lakes						X		X		F		unk	
Jonestown	Travis	3,948	675	Highland Lakes						X		X	1	E		unk	
Kelly Lane WCID 1	Travis	1,693	322	Trinity Aquifer			X					X	2				
La Grange	Fayette	5,478	957	Yegua-Jackson	X		X			X		X	2,3	P		unk	
Llano	Llano	3,565	862	Llano Lake		X						X					
Loop 360 WSC	Travis	2,086	1,225	Highland Lakes								X					
Markham MUD	Matagorda	1,013	97	Gulf Coast Aquifer			X					X	2				
Matagorda County WCID 6	Matagorda	1,099	113	Gulf Coast Aquifer			X					X	2				
Matagorda Waste Disposal & WSC	Matagorda	691	127	Gulf Coast Aquifer			X					X	2				

Entity					Potential Emergency Water Supply Source(s)								Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/ year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Meadowlakes	Burnet	2,540	852	Colorado Run-of-River			X			X		X	1,2	J		unk	
North San Saba WSC	San Saba	647	185	Ellenburger-San Saba			X					X	2				
Palacios	Matagorda	5,019	615	Gulf Coast Aquifer			X					X	2				
Rollingwood	Travis	1,421	383	Austin Water Contract			X					X	2				
Rough Hollow in Travis County	Travis	2,767	589	Highland Lakes			X					X	2				
Senna Hills MUD	Travis	1,219	420	Highland Lakes			X			X		X	2	M		unk	
Shady Hollow MUD	Travis	4,366	793	Austin Water Contract			X					X	2				
Smithville	Bastrop	4,797	821	Carrizo-Wilcox	X		X					X	2,3				
Sweetwater Community	Travis	2,760	408	Highland Lakes			X					X	2				
Travis County MUD 10	Travis	348	74	Highland Lakes			X			X		X	2	unk		unk	
Travis County MUD 14	Travis	2,015	172	Carrizo-Wilcox			X					X	2				
Travis County MUD 4	Travis	2,446	1,500	Highland Lakes						X		X		H,K		unk	
Travis County WCID 18	Travis	6,344	1,070	Highland Lakes			X			X		X	1,2	K		unk	
Travis County WCID 19	Travis	682	449	Highland Lakes						X		X		H,K		unk	

Entity					**Potential Emergency Water Supply Source(s)**								**Implementation Requirements**				
Water User Group Name	County	2020 Population	2020 Demand (AF/ year)	Supply Source	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required (numerical values explained on pg 7-9)	Entity providing supply (letter codes explained on pg 7-9)	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
Travis County WCID 20	Travis	1,130	584	Highland Lakes						X		X	1	A		unk	
Travis County WCID Point Venture	Travis	1,036	255	Highland Lakes			X			X		X	2	N		unk	
Weimar	Colorado	2,164	496	Gulf Coast Aquifer	X		X					X	2,3				
Wharton County WCID 2	Wharton	2,235	456	Gulf Coast Aquifer			X					X	2				

Type of Infrastructure Required:

1. Transmission pipeline and pump station
2. Water Well
3. River intake, transmission pipeline, and surface water treatment plant

Entities potentially providing emergency interconnect water

A. Travis County MUD 4
B. Horseshoe Bay
C. Sunrise Beach
D. Cottonwood Shores
E. Lago Vista
F. Lakeway MUD or Travis County WCID 17
G. Jonestown
H. Austin
I. Meadowlakes
J. Marble Falls
K. Travis County WCID 20
L. West Travis County PUA
M. Hurst Creek MUD
N. Travis County MUD 1
O. Buda
P. Fayette WSC West

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Table 7.2: County-Other WUGs in Region K

Entity					Potential Emergency Water Supply Source(s)								Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required	Entity providing supply	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
County-Other	Bastrop	7,794	1,418	Carrizo Wilcox / Highland Lakes			X			X		X	well	Aqua WSC			
County-Other	Blanco	8,141	1,008	Ellenburger-San Saba Aquifer / Hickory / Trinity / Canyon Lake			X					X	well				
County-Other	Burnet	22,242	3,414	Ellenburger-San Saba / Hickory / Marble Falls Aquifer / Other Alluvium / Trinity / Highland Lakes			X					X	well				
County-Other	Colorado	11,810	1,453	Gulf Coast Aquifer			X					X	well				

Entity					Potential Emergency Water Supply Source(s)								Implementation Requirements				
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required	Entity providing supply	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
County-Other	Fayette	9,532	1,238	Gulf Coast Aquifer / Fayette WSC / Sparta / Yegua-Jackson / Highland Lakes			X					X	well				
County-Other	Gillespie	14,739	1,735	Edwards-Trinity Plateau / Ellenburger-San Saba / Hickory / Highland Lakes			X					X	well				
County-Other	Hays (p)	10,986	1,351	Edwards-BFZ / Trinity / Canyon Lake			X					X	well				
County-Other	Llano	2,455	260	Ellenburger-San Saba / Hickory / Other-alluvium / Highland Lakes			X			X		X	well	Horse-shoe Bay			
County-Other	Matagorda	9,928	1,036	Gulf Coast Aquifer			X					X	well				
County-Other	Mills	2,676	343	Ellenburger-San Saba / Trinity			X					X	well				

Entity					**Potential Emergency Water Supply Source(s)**								**Implementation Requirements**				
Water User Group Name	County	2020 Population	2020 Demand (AF/year)	Supply Source(s)	Release from upstream reservoir	curtailment of upstream/downstream water rights	local groundwater well	brackish groundwater limited treatment	brackish groundwater desalination	emergency interconnect	other named local supply	trucked-in water	Type of infrastructure required	Entity providing supply	Other local entities required to participate/ coordinate	Emergency agreements/ arrangements already in place?	other
County-Other	San Saba	1,403	218	Ellenburger-San Saba / Hickory / Marble Falls / Highland Lakes			X					X	well				
County-Other	Travis	6,206	870	Carrizo-Wilcox / Other Aquifer / Trinity / Highland Lakes			X			X		X	well	Lakeway MUD			
County-Other	Wharton (p)	14,640	2,385	Gulf Coast			X					X	well				
County-Other	Williamson (p)	434	67	Colorado Run-of-River, Highland Lakes			X					X	well				

7.5 REGION-SPECIFIC DROUGHT RESPONSE RECOMMENDATIONS AND MODEL DROUGHT CONTINGENCY PLANS

7.5.1 Surface Water

The Highland Lakes and Colorado River provide substantial water supply to the Lower Colorado Region, and almost exclusively provide the primary source water for a number of Central Texas municipal utilities, including Austin (Austin Water). The Lower Colorado River Authority manages the Highland Lakes and closely monitors total combined storage in the lakes and establishes drought stages based on combined storage levels. *Table 7.3* below summarizes recommended drought stage triggers and actions as identified in the LCRA's DCP for Firm Water Customers. LCRA requires all customers to submit drought contingency plans (DCPs) stating the specific combined storage triggers located in its water management plan and requires customers to update their plans every five years. Austin also follows Drought Contingency Plan triggers based on the combined storage levels in the Highland Lakes, as well as other triggers based on peak day system demand.

Table 7.3: Summary of LCRA Recommended Drought Triggers and Responses

Drought Stage	Trigger	Action
Stage 1	Combined Storage less than 1.4 million acre-feet and interruptible stored water is being curtailed	5% reduction by customers
Stage 2	Combined Storage less than 900,000 acre-feet and interruptible stored water is being curtailed	10-20% reduction by customers LCRA will implement an aggressive public information campaign
Stage 3	LCRA Board of Directors declares a Drought Worse than the Drought of Record	Minimum 20% reduction by customers and encouragement to use alternative supplies All uses of interruptible stored water will be cut off.
Stage 4	LCRA Board determines that conditions constitute a water supply emergency	Determined by LCRA Board. Encourage customers to use alternative water supplies

Based on LCRA Drought Contingency Plan for Firm Water Customers, February 2019.

The Lower Colorado Regional Water Planning Group (LCRWPG) acknowledges that the Major Water Providers in Region K have extensive knowledge regarding surface water sources in the region, and they may play a leadership role in developing appropriate drought response actions for themselves and their customers. Please see *Appendix 7A* for severe and critical/emergency triggers and responses associated with the surface water customers of the Major Water Providers in the region. One area the LCRWPG feels could potentially be improved upon is the coordination and uniformity of Drought Stage levels for all users of a particular source. It has been acknowledged that there can be some confusion when two water users of the same water source are at different Drought Stage levels, even if they are implementing similar drought responses. No unnecessary or counterproductive variations in specific drought response strategies among user groups in Region K were identified that may confuse the public or otherwise impede drought response efforts.

7.5.2 Groundwater

A large portion of the region uses groundwater as their main source of supply. Throughout the region, the Drought Contingency Plans for groundwater users are developed specifically to their use and location. Aquifer characteristics can vary across the region and it can be difficult to require the same triggers for all users of a particular groundwater source that covers several counties. The LCRWPG acknowledges that the municipalities and water utilities that rely upon groundwater should have the best knowledge to develop their Drought Contingency Plan triggers and responses using their specialized knowledge. Please see *Appendix 7A* for severe and critical/emergency triggers and responses associated with groundwater users in the region. Even so, the LCRWPG encourages ongoing coordination between groundwater users, Groundwater Conservation Districts, and the Groundwater Management Areas to monitor local conditions for necessary modifications to the Drought Contingency Plans.

Several resources are available to aid in drought monitoring. The following sources provide information related to drought that groundwater suppliers, Groundwater Conservation Districts, and Groundwater Management Areas can all use to monitor drought conditions and help aid in making decisions related to triggers and drought response.

Texas Drought Preparedness Council:
http://www.txdps.state.tx.us/dem/CouncilsCommittees/droughtCouncil/stateDroughtPrepCouncil.htm

Palmer Drought Severity Index:
https://www.drought.gov/drought/data/category/pdsi-palmer-drought-severity-index

TCEQ drought information:
https://www.tceq.texas.gov/response/drought

7.5.3 Region-Specific Model-Drought Contingency Plans

Model drought contingency plans addressing the requirements of 30 TAC Chapter §288(b) were developed for Region K and are available in *Appendix 7B*. Model plans were developed for wholesale water providers, retail public water suppliers, irrigation water users, and steam-electric water users, based on the recommendations of the Drought Preparedness Council this planning cycle. The recommendation was to include region-specific model drought contingency plans for any water use category that uses 10 percent or more of the region’s water demand in any given decade. Other than for steam-electric, these model plans were largely based on templates provided by the TCEQ with modifications made to acknowledge coordination with the Lower Colorado Regional Water Planning Group and to make the template more specific to the region. The TCEQ does not have templates for steam-electric water users, so a model plan was developed using a Drought Contingency Plan from a steam-electric facility in the region as an example.

7.6 DROUGHT MANAGEMENT WATER MANAGEMENT STRATEGIES

7.6.1 Potentially Feasible Drought Management WMS Considered

The Lower Colorado Regional Water Planning Group considers drought management an integral component of meeting the future water needs of the Region. Although drought management measures are often temporary mechanisms to reduce water consumption and drought impact, it is equally evident that some drought management measures may develop into permanent shifts or reductions in water use practices in the region. The Lower Colorado River Authority and Austin (Austin Water), as well as other smaller water providers throughout the Region, have implemented drought contingency measures largely since 2011. These measures and the subsequent awareness for mindful water use among citizens have become an important part of managing water supplies throughout the Region, particularly in the Highland Lakes.

Drought management as a water management strategy was considered for each municipal WUG, regardless of whether they had water needs. In general, the following guidelines were utilized in considering drought management as a municipal WUG strategy:

- For municipal WUGs with GPCD equal to or less than 100 gallons per capita daily, a 5% demand reduction was recommended.
- For municipal WUGs with GPCD greater than 100 gallons per capita daily, a 20% demand reduction was recommended.
- The demand reduction percentages listed above were modified based on available Drought Contingency Plans for individual WUGs to reflect the utilities' identified goal for reduction during severe drought.
- Consideration was given whether water use restrictions were in place in 2011.

Drought management was also considered as a potentially feasible strategy for several irrigation water user groups with water needs. Irrigation in Colorado, Matagorda, and Wharton counties has severe shortages throughout the planning period, and drought management may be a necessary strategy to implement. Rice farming is prominent in these three counties, and generally involves growing both a first and second (ratoon) crop. Drought management would assume that most rice farmers would grow only a first crop and not a second crop. In addition, drought management is recommended for irrigation in Mills County (Brazos Basin.) There are limited supplies of water in that area of the county, and it is assumed that the water use by agriculture would be reduced based on drought conditions.

7.6.2 Recommended Drought Management WMS

Drought management was recommended as a water management strategy for nearly all municipal WUGs that have Region K as their primary region, and for the irrigation WUGs mentioned in *Section 7.6.1*. Triggers associated with these recommended strategies include those referenced in the LCRA Water Management Plan and the individual utility drought contingency plans. The Palmer Drought Severity Index is another resource that could be used for determining triggers for these strategies. Please refer to *Chapter 5* for additional details.

Total water savings for municipal and irrigation-related drought management strategies within the Region reach approximately 83,000 ac-ft/yr by the year 2070, with the largest portion of that coming from municipal utilities.

Other recommended drought-related strategies that may be implemented specifically to help manage extreme drought conditions and extend water supplies include two strategies for Austin (Austin Water). The two Austin strategies include the Indirect Potable Reuse through Lady Bird Lake strategy and the Lake Austin Operations strategy, both discussed more fully, including drought triggers, in *Chapter 5*. In addition, Llano has a recommended strategy for purchasing water that would need to be trucked in. It is acknowledged that this strategy would only be implemented under extreme drought conditions where senior downstream water users divert all of their authorized water. This strategy is discussed in more detail in *Chapter 5*.

7.6.3 Alternative Drought Management WMS

There is one alternative strategy for LCRA that would likely be implemented only during times of drought. This is the Supplement Bay and Estuary Inflows with Brackish Groundwater strategy, discussed in *Chapter 5*.

7.7 OTHER DROUGHT RECOMMENDATIONS

Housed within the Office of Emergency Management within the Texas Department of Public Safety, the Drought Preparedness Council was authorized and established by the 76th legislature (HB-2660) in 1999, subsequent to the establishment of the Drought Monitoring and Response Committee (75th legislature, SB1.) The Council is composed of representatives of state agencies and appointees by the governor. As defined by the Texas Water Code, the Council is responsible for the monitoring and assessing drought conditions and advising elected and planning officials about drought-related topics.

During the 2021 cycle, the Lower Colorado Regional Water Planning Group (LCRWPG) reviewed and considered recommendations from the Drought Preparedness Council with regards to developing region-specific model drought contingency plans for water use categories in the region with more than 10 percent of water demands, as well as following the outline template provided by the Texas Water Development Board, making an effort to fully address the assessment of current drought preparations, as well as planned responses to local drought conditions or loss of municipal supply. The LCRWPG recommended conservation and drought management as water management strategies for municipal water user groups, which will aid in buffering any unanticipated population growth.

The Lower Colorado Regional Water Planning Group recognizes that the most valuable contingency will be completed at a local level. Further guidance and regional cooperation would be valuable in producing meaningful plans with clear trigger definition and implementation guidance. Communication of these between state, regional, and local levels would also further facilitate necessary emergency responses when drought measures need to be implemented. The following recommendations are made to support development and implementation of meaningful Drought Contingency Plans during times of drought:

- Uniform consistency of drought stage definition among users of the same source of water.
- Coordination by water providers with local Groundwater Conservation Districts, in order to consider more uniform triggers and responses from a particular source within the district, as applicable.

- Coordination with wholesale providers regarding drought conditions and potential implementation of drought stages.
- Communication with customers upon reaching a voluntary drought stage level to raise public awareness and facilitate potential implementation of drought measures.
- Communication with customers upon reaching a mandatory drought stage level to reinforce the importance of compliance with mandatory drought measures and emphasize heightened need for public awareness.

APPENDIX 7A

Existing Drought Triggers and Reduction Goals

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
AQUA WSC	BASTROP	CARRIZO-WILCOX AQUIFER	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 20% reduction in daily demand sufficient to meet basic water needs for public health and safety.	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 25% reduction in daily demand sufficient to meet basic water needs for public health and safety.
AQUA WSC	FAYETTE	CARRIZO-WILCOX AQUIFER	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 20% reduction in daily demand sufficient to meet basic water needs for public health and safety.	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 25% reduction in daily demand sufficient to meet basic water needs for public health and safety.
AQUA WSC	TRAVIS	CARRIZO-WILCOX AQUIFER	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 20% reduction in daily demand sufficient to meet basic water needs for public health and safety.	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	Minimum 25% reduction in daily demand sufficient to meet basic water needs for public health and safety.
AUSTIN	HAYS	HIGHLAND LAKES and COLORADO RUN-OF-RIVER	Combined lake storage falls below 600,000 AF or a drought worse than the drought of record is declared.	Reduce water use by a minimum of 20% from a baseline approved by LCRA, which may account for City's conservation measures.	As determined by City Manager, system outage, equipment failure, contamination of water source or other emergencies.	Reduce water use to levels deemed necessary.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
AUSTIN	TRAVIS	HIGHLAND LAKES and COLORADO RUN-OF-RIVER	Combined lake storage falls below 600,000 AF or a drought worse than the drought of record is declared.	Reduce water use by a minimum of 20% from a baseline approved by LCRA, which may account for City's conservation measures.	As determined by City Manager, system outage, equipment failure, contamination of water source or other emergencies.	Reduce water use to levels deemed necessary
AUSTIN	WILLIAMSON	HIGHLAND LAKES and COLORADO RUN-OF-RIVER	Combined lake storage falls below 600,000 AF or a drought worse than the drought of record is declared.	Reduce water use by a minimum of 20% from a baseline approved by LCRA, which may account for City's conservation measures.	As determined by City Manager, system outage, equipment failure, contamination of water source or other emergencies.	Reduce water use to levels deemed necessary.
BARTON CREEK WEST WSC	TRAVIS	HIGHLAND LAKES	Either of the following criteria is met: a. For surface water supply systems, when total daily water demand equals or exceeds 85% of: a. the total design capacity of a WTCPUA water treatment plant for three consecutive days; or b. The LCRA Board determines a drought worse than the drought of record.	Minimum 20% reduction in use	Include, but are not limited to, the following: a. Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service, b. Contamination of the water supply source, c. Any other emergency water supply or demand conditions that the WTCPUA Water Services executive manager, or designee, determines to constitute a water supply emergency more severe than that contemplated in the triggers contained in the LCRA Water Management Plan	As determined by the WTCPUA Board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
BARTON CREEK WSC	TRAVIS	HIGHLAND LAKES	The District will declare that a severe water shortage condition exists when average daily water consumption reaches 95% of production/distribution capacity for a period of 3 days.	25% reduction in demand	The District will declare that an emergency water shortage condition exists when the Board of Directors determine that Stage 4 implementation is necessary pursuant to requirements specified in the District's wholesale water purchase contract with the Lower Colorado River Authority or when the Board of Directors declares that Stage 4 implementation is necessary due to a system outage or catastrophic equipment failure.	Additional pro-rata curtailment in total water use specified by LCRA.
BASTROP	BASTROP	OTHER AQUIFER	Daily water demand exceeds 95% of total production capability for 3 consecutive days and that response measures required by Stage 2 have been implemented, and City Manager determines demand will not drop below without conservation by customers.	Achieve reduction in daily demand to 95% or less of the Total Production Capability.	1. Major water line breaks, or pump or system failures occur, which cause a substantially significant threat of a loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s); or 3. Daily water demand equals 100% of the Total Production Capability for three consecutive days.	Achieve reduction in daily demand sufficient to assure the water system for the protection of public health and safety until the Stage 4 Trigger criteria(s) can be abated.
BASTROP COUNTY WCID 2	BASTROP	CARRIZO-WILCOX AQUIFER	NA	NA	NA	NA
BAY CITY	MATAGORDA	GULF COAST AQUIFER	Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when the total daily water demand equals or exceeds 90% of the City of Bay City's water wells pumping capacity for 7 consecutive days.	20% reduction in demand	a. Major water line breaks, pump or system failures occur which cause unprecedented loss of capability to provide water service; or maintain an adequate level in the storage facilities b. Natural or man-made contamination of the water supply source(s).	40% reduction in demand

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
BERTRAM	BURNET	ELLENBURGER-SAN SABA	(i) The static water level in city Well Number 9 (Felps Well) is 75 feet or greater below the surface of the ground. (ii) The total daily water demand equals or exceeds 550,000 gallons for four (4) consecutive days or 600,000 gallons on a single day. (iii) Continually falling treated water reservoir levels do not refill above 60% overnight.	11% reduction from either or both the 550,000 gallon daily water demand and the 600,000 gallon single day demand.	(i) When the static water level in city Well Number 9 (Felps Well) is 85 feet or greater below the surface of the ground. (ii) When total daily water demand equals or exceeds 575,000 gallons for four (4) consecutive days or 625,000 gallons on a single day. (iii) Continually falling treated water reservoir levels do not refill above 40% overnight.	Achieve a 20% reduction from either or both the 575,000 gallon daily water demand and the 625,000 gallon single day demand.
BLANCO	BLANCO	BLANCO LAKE, CANYON LAKE, and TRINITY AQUIFER	Water System Demand has reached 85% of the available water supply capacity for 3 consecutive days.	30% reduction	The water system demand has reached 95% of the available water supply capacity for 3 consecutive days; or if less than 90 days of storage exists in the cities Blanco River Reservoirs.	40% reduction
Blanco-Pedernales GCD	BLANCO	Several aquifers in Blanco County	District General Manager monitors conditions and considers City of Blanco and Johnson City declarations			
BOLING MWD	WHARTON	GULF COAST AQUIFER	NA	NA	NA	NA
BRIARCLIFF	TRAVIS	HIGHLAND LAKES	Combined lake storage falls below 600,000 AF or a drought worse than the drought of record is declared.	20% reduction in water use	Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	Water Supply Reduction Target: As determined by the LCRA Board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
BROOKESMITH SUD	MILLS	BROWNWOOD LAKE	a. Supply-Based Triggers: Wholesale supplier's drought Stage III b. Demand- or Capacity-Based Triggers: Total daily demand equals or exceeds 3.7 mgd for 3 consecutive days or 4 mgd on a single day. c. Production or distribution limitations.	10% reduction in demand	a. Supply-Based Triggers: Wholesale supplier's drought Stage IV or supply contamination. b. Demand- or Capacity-Based Triggers: Total daily demand equals or exceeds 4 mgd for 3 consecutive days. c. Production or distribution limitations: When imminent or actual failure of a major component of the system which would cause an immediate health or safety hazard. d. System outage.	25% reduction in demand
BS/EACD		EDWARDS-BFZ and TRINITY AQUIFER	Monitored by BS/EACD, Critical Stage using Barton Spring Flow less than or equal to 38 cfs, Lovelady Well depth greater than or equal 462.7 msl	20% curtailment	Monitored by BS/EACD, Critical Stage using Barton Spring Flow less than or equal to 20 cfs, Lovelady Well depth greater than or equal 457.1 msl	30% curtailment
BUDA	HAYS	EDWARDS-BFZ and CANYON LAKE	One of the following conditions occur: 1. BSEACD declares an exceptional stage in accordance with its Drought Contingency Plan; 2. GBRA declares Stage III drought in accordance with their Drought Contingency Plan; 3. Daily demand reaches 85% of available supply, based on the City's current water supply resulting from any curtailments implemented by water suppliers, for five consecutive days; or 4. A water quality, supply, distribution system or other emergency exists as determined by the City Manager.	30% reduction in use	One of the following conditions occur: 1. BSEACD declares an emergency response stage in accordance with its Drought Contingency Plan; 2. GBRA declares Stage IV drought in accordance with their Drought Contingency Plan; 3. Daily demand reaches 90% of available supply, based on the City's current water supply resulting from any curtailments implemented by water suppliers, for five consecutive days; or 4. A water quality, supply, distribution system or other emergency exists as determined by the City Manager.	40% reduction in use

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
BURNET	BURNET	ELLENBURGER-SAN SABA	(i) Total daily water demand equals or exceeds 90% of the total system distribution or treatment capacity for three consecutive days; (ii) Any other system demand or supply factors that, in the opinion of the City Manager, could jeopardize the health, safety and welfare of the public; (iii) Weather conditions have occurred and/or are predicted to occur which could jeopardize the long-term sustainability of the City's water apply; (iv) The declaration of a Drought Worse than the Drought of Record by the Lower Colorado River Authority.	During this stage, the target reduction goal is a minimum of 20%.	(i) Customers shall be required to comply with the requirements and restrictions for Stage 4 of this Plan when the City Manager declares it is in the best interest of the City due to emergency situations, or system demand/supply factors that could jeopardize the health, safety and welfare of the public. (ii) Weather conditions have occurred and/or are predicted to occur which could jeopardize the long-term sustainability of the City's water supply; (iii) The declaration of a Drought Worse than the Drought of Record by the Lower Colorado River Authority.	During this stage, the target reduction goal is a minimum of 30%.
CANEY CREEK MUD OF MATAGORDA COUNTY	MATAGORDA	GULF COAST AQUIFER	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CANYON LAKE WATER SERVICE	BLANCO	CANYON LAKE	a) Failure of a major component of the system or an event which reduces the minimum residual pressure in the system below 20 psi for a period of 24 hours or longer. b) Water consumption has reached 95% or more of the maximum production capacity for three consecutive days. c) Water consumption of 100% of the maximum production capacity and water storage levels in the system are unable to recover in one 24 hour period. d) Other unforeseen events which could cause imminent health or safety risks to the public. e) Canyon Reservoir water surface elevation drops to a level of 880 ft. msl or lower.	25% reduction in demand	a) Failure of a major component of the system or an event which reduces the minimum residual pressure in the system below 20 psi for a period of 24 hours or longer. b) Water consumption has reached 95% or more of the maximum production capacity for three consecutive days. c) Water consumption of 100% of the maximum production capacity and water storage levels in the system are unable to recover in one 24 hour period. d) Other unforeseen events which could cause imminent health or safety risks to the public. e) Canyon Reservoir water surface elevation drops to a level of 880 ft. msl or lower.	25% reduction in demand
CEDAR PARK	TRAVIS	HIGHLAND LAKES	(i) Total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days; (ii) The combined storage of Lakes Buchanan and Travis are less than 750,000 acre-feet but greater than 600,000 acre-feet; (iii) Water system is contaminated whether accidentally or intentionally. Severe condition is reached immediately upon detection; and/or (iv) City Manager discretion.	Minimum 20% reduction in daily demand	To be determined by City Manager	Minimum 30% reduction in daily water demand or as determined by the LCRA board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CIMARRON PARK WATER	HAYS	EDWARDS-BFZ	NA	NA	NA	NA
COLUMBUS	COLORADO	GULF COAST AQUIFER	a) Average daily water consumption reaches 110% of production capacity (1,870,000 gpd); b) Average daily water consumption will not enable storage levels to be maintained; c) System demands exceeds available high service pump capacity; d) Any two conditions listed in moderate drought classification occurs at the same time for a 24 hour period; e) Water system is contaminated either accidentally or intentionally; f) Water systems fails - from acts of God (tornadoes, hurricanes, or other natural disasters) or man-made. Severe condition is reached immediately upon detection; g) Any or all of the above conditions.	NA	a) Average daily water consumption reaches 110% of production capacity (1,870,000 gpd); b) Average daily water consumption will not enable storage levels to be maintained; c) System demands exceeds available high service pump capacity; d) Any two conditions listed in moderate drought classification occurs at the same time for a 24 hour period; e) Water system is contaminated either accidentally or intentionally; f) Water systems fails - from acts of God (tornadoes, hurricanes, or other natural disasters) or man-made. Severe condition is reached immediately upon detection; g) Any or all of the above conditions.	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	BURNET	ELLENBURGER-SAN SABA, TRINITY, HICKORY, HIGHLAND LAKES, and MARBLE FALLS	(a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	COLORADO	GULF COAST AQUIFER	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	LLANO	ELLENBURGER-SAN SABA, HICKORY, and HIGHLAND LAKES	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	LLANO	ELLENBURGER-SAN SABA, HICKORY, and HIGHLAND LAKES	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	MATAGORDA	GULF COAST AQUIFER	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual system are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	MILLS	HIGHLAND LAKES	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days , or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CORIX UTILITIES TEXAS INC	SAN SABA	ELLENBURGER-SAN SABA, HICKORY, MARBLE FALLS, and HIGHLAND LAKES	Any of the following criteria is met: (a) When total daily water demand equals or exceeds 95% of the total design capacity of a Corix water treatment plant for three consecutive days, or 97% on a single day under normal operating conditions; or (b) For groundwater systems, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three consecutive days; or (c) When the combined storage level of lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA Drought Contingency Plan for Firm Water Customers. There is also a water use reduction target of 20%; or (d) When any other additional trigger criteria for individual systems are achieved.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; or (b) Natural or man-made contamination of the water supply source; or (c) Any other emergency water supply or demand issue the Corix Utilities (Texas) General Manager determines to warrant the declaration of Stage 4; or (d) Any other emergency water supply or demand conditions that LCRA determines to constitute a water supply emergency more severe that that contemplated in the triggers contained in the LCRA Water Management Plan, including a drought more severe than the drought of record. Water use reduction targets shall be determined by LCRA for its Firm Water Customers.	The target for all Corix Utilities (Texas) water utility systems required to implement their drought contingency plans based on capacity criteria is limiting daily water demand to 80% of water treatment or pumping capacity.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
COTTONWOOD CREEK MUD 1	TRAVIS	CARRIZO-WILCOX	a. the water system is contaminated, whether accidentally or intentionally (Stage 3 may be reached immediately upon detection of contamination); b. the water system fails due to an act of God (tornadoes, hurricanes) or man (Stage 3 may be reached immediately upon detection of the failure); c. any mechanical failure of pumping equipment which will require more than 12 hours to repair and which causes unprecedented loss of capability to provide water service; d. required under any District water supply contract; e. the availability of the District's water supply is reduced up to a drought of record; or f. otherwise approved by the Board.	30% reduction in average daily use	a. there is a failure of water supply or distribution facilities; b. there is a contamination of water source; c. required under any District water supply contract; d. the District Manager or his/her designee, in consultation with the Board President or Vice President, considers it necessary; or e. otherwise approved by the Board.	40% reduction in average daily use
COTTONWOOD SHORES	BURNET	HIGHLAND LAKES	City Administrator of Cottonwood Shores (designated official), or his/her designee, determines that a water supply emergency exists based on: 1) LCRA declares a drought worse than the drought of record or other shortage resulting from emergency. 2) The total storage in Lakes Buchanan and Travis is at or below 600,000 acre-ft. 3) Upon notification from LCRA that it is implementing stage 3 of the LCRA Drought Contingency Plan.	20% reduction in use	When one or a combination of the following occurs: 1) Major water line breaks, or pump or system failures ovvur, which cause unprecedented loss of capability to provide water service. 2) Natural or man-made contamination of the water supply source(s). 3) Any other emergencies are determined and declared by the City and LCRA associated with a drought worse than the drought of record.	Water use will be prohibited for any portions of the distribution system affected until further notice. Achieve 25% reduction in total water use or a prescribed LCRA drought contingency plan reduction target

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
COUNTY-OTHER	BASTROP	CARRIZO-WILCOX and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	BLANCO	ELLENBURGER-SAN SABA, HICKORY, and TRINITY	NA	NA	NA	NA
COUNTY-OTHER	BURNET	ELLENBURGER-SAN SABA, HICKORY, MARBLE FALLS, TRINITY, OTHER AQUIFER, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	COLORADO	GULF COAST AQUIFER	NA	NA	NA	NA
COUNTY-OTHER	FAYETTE	GULF COAST AQUIFER, OTHER AQUIFER, SPARTA, YEGUA-JACKSON, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	GILLESPIE	EDWARDS-TRINITY-PLATEAU, ELLENBURGER-SAN SABA, HICKORY, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	HAYS	EDWARDS-BFZ, TRINITY, CANYON LAKE/RESERVOIR	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
COUNTY-OTHER	LLANO	ELLENBURGER-SAN SABA, HICKORY, OTHER AQUIFER, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	MATAGORDA	GULF COAST AQUIFER	NA	NA	NA	NA
COUNTY-OTHER	MILLS	ELLENBURGER-SAN SABA and TRINITY	NA	NA	NA	NA
COUNTY-OTHER	SAN SABA	ELLENBURGER-SAN SABA, HICKORY, MARBLE FALLS, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	TRAVIS	CARRIZO-WILCOX, TRINITY, OTHER AQUIFER, and HIGHLAND LAKES	NA	NA	NA	NA
COUNTY-OTHER	WHARTON	GULF COAST AQUIFER	NA	NA	NA	NA
COUNTY-OTHER	WILLIAMSON	CITY OF AUSTIN - ROR (MUNICIPAL), TRINITY, and EDWARDS-BFZ	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CREEDMOOR-MAHA WSC	BASTROP	CARRIZO-WILCOX AQUIFER	1) Water consumption has reached 90% of the amount available for 3 consecutive days. 2) The water level in any of the water storage tanks cannot be replenished for 3 consecutive days or as may otherwise be indicated in the Corporation's approved drought management plan. 3) Critical Stage pumpage reductions are ordered by the Barton Springs/Edwards Aquifer Conservation district, the City of Austin Water Utility, or Aqua Water Supply Corporation; or similar water conservation order by the TCEQ or other empowered agency.	30% reduction in daily use over baseline conditions	1) Failure of a major component of the system or an event which reduces minimum residual pressure in the system below 20 psi for a period of 24 hours or longer. 2) Water consumption of 95% or more of the maximum available for 3 consecutive days. 3) Water consumption of 100% of the maximum available and the water storage levels in the system drop during one 24-hour period. 4) Other unforeseen events that could cause imminent health or safety risks to the public. 5) Exceptional Stage pumpage reductions are ordered by the Barton Springs/Edwards Aquifer Conservation District, the City of Austin Water Utility, or Aqua Water Supply Corporation; or similar water conservation order by the TCEQ or other empowered agency is issued.	40% reduction in daily use over baseline conditions

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
CREEDMOOR-MAHA WSC	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL) and EDWARDS-BFZ	1) Water consumption has reached 90% of the amount available for 3 consecutive days. 2) The water level in any of the water storage tanks cannot be replenished for 3 consecutive days or as may otherwise be indicated in the Corporation's approved drought management plan. 3) Critical Stage pumpage reductions are ordered by the Barton Springs/Edwards Aquifer Conservation district, the City of Austin Water Utility, or Aqua Water Supply Corporation; or similar water conservation order by the TCEQ or other empowered agency.	30% reduction in daily use over baseline conditions	1) Failure of a major component of the system or an event which reduces minimum residual pressure in the system below 20 psi for a period of 24 hours or longer. 2) Water consumption of 95% or more of the maximum available for 3 consecutive days. 3) Water consumption of 100% of the maximum available and the water storage levels in the system drop during one 24-hour period. 4) Other unforeseen events that could cause imminent health or safety risks to the public. 5) Exceptional Stage pumpage reductions are ordered by the Barton Springs/Edwards Aquifer Conservation District, the City of Austin Water Utility, or Aqua Water Supply Corporation; or similar water conservation order by the TCEQ or other empowered agency is issued.	40% reduction in daily use over baseline conditions
CYPRESS RANCH WCID 1	TRAVIS	HIGHLAND LAKES and TRINITY	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
DEER CREEK RANCH WATER	HAYS	HIGHLAND LAKES and EDWARDS-BFZ	1. Treatment Capacity: -For surface water systems, when total daily water demand equals or exceeds 95 percent of the total operating system treatment capacity for three consecutive days, or 97 percent on a single day; or -For groundwater systems, when maximum daily usage equals or exceeds 95 percent of the pump's withdrawal capacity for three consecutive days. 2. Water Supply: -Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or -The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	System Capacity Reduction Target: Limit daily water demand to no more than 80% capacity for three days or 85% for one day. Water Supply Reduction Target: Achieve a minimum 20% reduction in water use.	1. Treatment Capacity: -Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2. Water Supply: - Natural or man-made contamination of the water supply source; or - Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	System Capacity Reduction Target: Achieve a minimum of 25% reduction in water use. Water Supply Reduction Target: As determined by the LCRA Board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
DEER CREEK RANCH WATER	TRAVIS	HIGHLAND LAKES	1. Treatment Capacity: -For surface water systems, when total daily water demand equals or exceeds 95 percent of the total operating system treatment capacity for three consecutive days, or 97 percent on a single day; or -For groundwater systems, when maximum daily usage equals or exceeds 95 percent of the pump's withdrawal capacity for three consecutive days. 2. Water Supply: -Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or -The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	System Capacity Reduction Target: Limit daily water demand to no more than 80% capacity for three days or 85% for one day. Water Supply Reduction Target: Achieve a minimum 20% reduction in water use.	1. Treatment Capacity: -Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2. Water Supply: - Natural or man-made contamination of the water supply source; or - Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	System Capacity Reduction Target: Achieve a minimum of 25% reduction in water use. Water Supply Reduction Target: As determined by the LCRA Board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
DRIPPING SPRINGS WSC	HAYS	HIGHLAND LAKES	One or a combination of: 1.) The static water level in DSWSC Well No. 4 is 225 ft or greater below the surface of the ground, 2.) The total daily water demand equals or exceeds 950,000 gallons for 4 consecutive days, 3.) The total daily water demand equals or exceeds 1,200,000 gallons on a single day, or 4.) Continually falling water reservoir levels do not refill above 50% overnight, or 5.) Notice is given by the LCRA that total daily water demand equals or exceeds 95% of the total operating surface water treatment capacity for 3 consecutive days, or 97% on a single day, or 6.) Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-ft, in accordance with the LRCA DCP, or 7.) The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	Minimum 20% reduction from either or both the 950,000 gallon daily water demand and the 1,200,000 gallon single day demand.	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s). 3. Any other emergency water supply or demand conditions the LCRA General Manager or the LCRA Board determines or is associated with the LCRA Board declaration of a drought worse than the Drought of Record.	Achieve a reduction in daily water demand sufficient that will allow DSWSC to supply water within the capability of the system during the emergency event.
EAGLE LAKE	COLORADO	GULF COAST AQUIFER	When water production exceeds 1,300,000 gallons per day for three (3) consecutive days.	NA	Water production exceeds 1,400,000 gallons per day for three (3) consecutive days.	NA
EL CAMPO	WHARTON	GULF COAST AQUIFER	Total daily demand equals or exceeds 4.5 MGD for 3 consecutive days or 5.0 MGD on a single day.	15% reduction in daily water pumpage	Total daily demand equals or exceeds 5.0 MGD for 3 consecutive days or 5.5 MGD on a single day.	20% reduction in daily water pumpage.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
ELGIN	BASTROP	CARRIZO-WILCOX AQUIFER	1. Average daily water consumption has reached 90% of rated production/distribution capacity for a three-day period or the aquifer level drops to a level which could be considered critical, and weather conditions indicate mild drought will exist five days or more. 2. Delivery capability is reduced due to a mechanical failure which will require more than 24 hours to repair.	NA	1. System demand exceeds available high service pump capacity; 2. There is detection of water systems failure from acts of God (tornados, hurricanes) or man; or 3. Delivery capability is reduced due to a mechanical failure which will require more than 12 hours to repair.	NA
ELGIN	TRAVIS	CARRIZO-WILCOX AQUIFER	1. Average daily water consumption has reached 90% of rated production/distribution capacity for a three-day period or the aquifer level drops to a level which could be considered critical, and weather conditions indicate mild drought will exist five days or more; or 2. Delivery capability is reduced due to a mechanical failure which will require more than 24 hours to repair.	NA	1. System demand exceeds available high service pump capacity; 2. There is detection of water systems failure from acts of God (tornados, hurricanes) or man; or 3. Delivery capability is reduced due to a mechanical failure which will require more than 12 hours to repair.	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
FAYETTE COUNTY WCID MONUMENT HILL	FAYETTE	GULF COAST, QUEEN CITY, SPARTA, and HIGHLAND LAKES	1. Average water demand reaches 496,800 gallons per day (75% of plant capacity) for three consecutive days. 2. All available standby water supply, such as Fayette Water Supply Corporation, is being used by its members.	15% reduction in demand	1. The imminent or actual failure of a major component of the system which would cause an immediate health or safety hazard, i.e. water well or plant equipment. 2. Natural or man-made contamination of the water supply source(s). 3. Water demand is exceeding the system capacity of 596,200 gallons per day (90% of plant capacity - 460 gpm water well) for two (2) consecutive days.	NA
FAYETTE WSC	FAYETTE	QUEEN CITY and GULF COAST	NA	NA	NA	NA
FLATONIA	FAYETTE	YEGUA-JACKSON and GULF COAST	NA	NA	NA	NA
FREDERICKSBURG	GILLESPIE	ELLENBURGER-SAN SABA and HICKORY	When the City Manager determines that Stage 3 conditions and commensurate water reduction goals have not been met or that the reductions in use are not otherwise sufficient based upon the criteria described above.	15% reduction in the Average Daily Water Demand or 25% reduction in the Maximum Daily Water Demand.	When the City Manager determines that Stage 4 conditions and commensurate water reduction goals have not been met or that the reductions in use are not otherwise sufficient based upon the criteria described above.	20% reduction in the Average Daily Water Demand or 40% reduction in the Maximum Daily Water Demand.
GARFIELD WSC	TRAVIS	TRINITY AQUIFER	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
GEORGETOWN	BURNET	EDWARDS-TRINITY and BRAZOS RIVER AUTHORITY	An event occurs where water demand exceeds the supply and severe conservation measures are required to maintain the ability to provide the proper level of service as determined by the GM, or designee.	Peak demand equal to the annual average daily usage (50% reduction).	1. Water demand approaches a reduced delivery capacity for all or part of the system, creating a situation in which water system demand exceeds water system capacity, for an extended length of time, as determined by the General Manager; 2. major water line break, or a pump or other system failure occurs, which causes a loss in the capability to provide treated water service; or 3. A natural or man-made contamination of the water supply.	Peak demand equal to or surpasses the annual average daily usage (50% reduction).
GOFORTH SUD	HAYS	CANYON LAKE and EDWARDS-BFZ	1. Any of Goforth SUD’s water providers initiates Stage II of their Drought Contingency Plan. 2. Water consumption has reached 90% of daily maximum supply for three (3) consecutive days. 3. The water level in any of the storage tanks cannot be replenished for three (3) consecutive days.	25% reduction in total use	1. Any of Goforth SUD’s water providers initiates Stage III of their Drought Contingency Plan. 2. Water consumption has reached 95% of daily maximum supply for three (3) consecutive days. 3. The water level in any of the storage tanks cannot be replenished for five (5) consecutive days.	30% reduction in use.
GOFORTH SUD	TRAVIS	CANYON LAKE and EDWARDS-BFZ	1. Any of Goforth SUD’s water providers initiates Stage II of their Drought Contingency Plan. 2. Water consumption has reached 90% of daily maximum supply for three (3) consecutive days. 3. The water level in any of the storage tanks cannot be replenished for three (3) consecutive days.	25% reduction in use	1. Any of Goforth SUD’s water providers initiates Stage III of their Drought Contingency Plan. 2. Water consumption has reached 95% of daily maximum supply for three (3) consecutive days. 3. The water level in any of the storage tanks cannot be replenished for five (5) consecutive days.	30% reduction in use.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
GOLDTHWAITE	MILLS	TRINITY and GOLDTHWAITE RESERVOIR	NA	NA	NA	NA
GRANITE SHOALS	BURNET	HIGHLAND LAKES	When (either, any of) the following condition(s) exist; or as determined by the mayor or his/her designee. (1) When, pursuant to requirements specified in the City of Granite Shoals wholesale water purchase contract with LCRA notification is received requesting initiation of stage 3 of the drought contingency plan or if initiation of stage 3 is requested by the Central Texas Ground Water Conservation District. (2) When total daily water demands equals or exceeds 95% of plant capacity for three consecutive days of 97% of plant capacity on a single day. (3) Continually falling treated water reservoir levels that do not refill above 75% overnight. (4) When, for groundwater systems, maximum daily usage exceeds 90% of the pumping system withdrawal capacity for three consecutive days.	30% reduction in daily demand compared to non-drought levels	When the mayor or his/her designee determines that a water supply emergency exists based on: (1) When, pursuant to requirements specified in the City of Granite Shoals wholesale water purchase contract with LCRA notification is received requesting initiation of stage 4 of the drought contingency plan or if initiation of stage 4 is requested by the Central Texas Ground Water Conservation District. (2) Major water line breaks, or pump or system failures occur, which cause critical loss of capability to provide water service; or (3) Natural or man-made contamination of the water supply source. (4) Any other emergency water supply or production/demand condition that the mayor or his/her designee determines that either constitutes a water supply emergency or is associated with a declaration of a drought worse than the drought of record. (5) When, for groundwater systems, maximum daily usage exceeds 95% of the pumping system withdrawal capacity for three consecutive days.	40% reduction in daily demand compared to non-drought levels

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
HAYS	HAYS	EDWARDS-BFZ	Notification by the Barton Springs/Edwards Aquifer Conservation District that the District has declared the aquifer to be in an Alarm Stage Drought.	Mandatory overall minimum 20% monthly reduction plus additional curtailments as directed by District Rules.	Notification by the Barton Springs/Edwards Aquifer Conservation District that the District has declared the aquifer to be in a Exceptional Stage Drought.	Mandatory overall minimum 40% monthly reduction plus additional curtailments as directed by District Rules.
HAYS COUNTY WCID 1	HAYS	HIGHLAND LAKES	One or more of the following triggering criteria are met: 1. When the WTCPUA total daily water demand equals or exceeds 85% of the total design capacity of the WTCPUA water treatment plant for three (3) consecutive days; 2. When the LCRA Board declares a drought worse than the drought of record or other water supply emergency and orders the mandatory curtailment of firm water supplies; or 3. For Customers using water from District groundwater sources, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three (3) consecutive days.	Minimum 20% reduction in daily demand	One or more of the following triggering criteria are met: 1. When major line breaks, loss of distribution pressure, or pump system failures cause substantial loss in ability to provide water service; 2. When natural or man-made contamination of the water supply occurs; or 3. Any other emergency water supply or demand conditions that the LCRA, the WTCPUA or the General Manager determines to constitute a water supply emergency more severe than that contemplated herein or in the triggers contained in the LCRA Water Management Plan.	Reduce water demand as determined by the Board.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
HAYS COUNTY WCID 2	HAYS	HIGHLAND LAKES	One or more of the following triggering criteria are met: 1. When the WTCPUA total daily water demand equals or exceeds 85% of the total design capacity of the WTCPUA water treatment plant for three (3) consecutive days; 2. When the LCRA Board declares a drought worse than the drought of record or other water supply emergency and orders the mandatory curtailment of firm water supplies; or 3. For Customers using water from District groundwater sources, when maximum daily usage equals or exceeds 95% of the pump's rated capacity for three (3) consecutive days.	Minimum 20% reduction in daily water demand	One or more of the following triggering criteria are met: 1. When major line breaks, loss of distribution pressure, or pump system failures cause substantial loss in ability to provide water service; 2. When natural or man-made contamination of the water supply occurs; or 3. Any other emergency water supply or demand conditions that the LCRA, the WTCPUA or the General Manager determines to constitute a water supply emergency more severe than that contemplated herein or in the triggers contained in the LCRA Water Management Plan.	Reduce water demand as determined by the Board.
Hays-Trinity GCD	HAYS	TRINITY AQUIFER	Monitors discharge of flow to the Pedernales River near Johnson City, rates of 10.2 cfs trigger "critical" conditions			
HORNSBY BEND UTILITY	TRAVIS	CARRIZO-WILCOX	75% water treatment capacity reached for 3 or more days in a week, or well pump hours per day are 18 hours for more than 3 days.	Reduce water consumption and usage by 20% through mandatory restrictions.	90% water treatment capacity reached for 3 or more days in a week, or well pump hours per day are 22 hours for more than 3 days.	Reduce water consumption and usage by 30%.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
HORSESHOE BAY	BURNET	HIGHLAND LAKES	(a) Drought year with severe water shortage conditions; (b) Loss or failure of water production or water distribution appurtenances or facility that would decrease water system supply capabilities by 25%; (c) When drought conditions worsen triggering the implementation of additional mandatory water restrictions; (d) Any surface water supplies withdrawal restriction enacted by the LCRA that would entail a reduction of 25% in water supply to the city; or (e) Short-term or long-term situation requiring a reduction of 25% in water consumption.	Target water demand reduction goal: 25%.	(a) Critical drought conditions, resulting in emergency water conditions and curtailment of water use; (b) Loss or damage to the city water production or water distribution appurtenance or facility that would decrease water supply system capabilities by 35%; (c) Any other emergency water supply or demand issue the LCRA general manager or the LCRA board determines to warrant the declaration of stage 4; (d) Any surface water supplies withdrawal restriction enacted by the LCRA that would entail a 35% reduction in water supply to the city; or (e) Any short-term or long-term water supply situation requiring a 35% reduction in water consumption.	Target water demand reduction goal: 35%.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
HORSESHOE BAY	LLANO	HIGHLAND LAKES and OTHER AQUIFER	(a) Drought year with severe water shortage conditions; (b) Loss or failure of water production or water distribution appurtenances or facility that would decrease water system supply capabilities by 25%; (c) When drought conditions worsen triggering the implementation of additional mandatory water restrictions; (d) Any surface water supplies withdrawal restriction enacted by the LCRA that would entail a reduction of 25% in water supply to the city; or (e) Short-term or long-term situation requiring a reduction of 25% in water consumption.	Target water demand reduction goal: 25%	(a) Critical drought conditions, resulting in emergency water conditions and curtailment of water use; (b) Loss or damage to the city water production or water distribution appurtenance or facility that would decrease water supply system capabilities by 35%; (c) Any other emergency water supply or demand issue the LCRA general manager or the LCRA board determines to warrant the declaration of stage 4; (d) Any surface water supplies withdrawal restriction enacted by the LCRA that would entail a 35% reduction in water supply to the city; or (e) Any short-term or long-term water supply situation requiring a 35% reduction in water consumption.	35% reduction
HURST CREEK MUD	TRAVIS	HIGHLAND LAKES	(a) When total daily water demand equals or exceeds 95% of the total design capacity of the HURST CREEK MUD water treatment plant for three consecutive days, or 97% on a single day; or (b) When combined storage of lakes Buchanan and Travis is less than 700,000 acre-feet.	Water Supply Reduction Target: Achieve a 15% reduction in water use.	(a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service, (b) Natural or man-made contamination of the water supply source, or (c) Any other emergency water supply or demand issue the HURST CREEK MUD General Manager or the HURST CREEK MUD Board determine to warrant the declaration of Stage 4. (d) When combined storage of lakes Buchanan and Travis is less than 600,000 acre-feet.	Water Supply Reduction Target: Achieve a 20% reduction in water use.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
JOHNSON CITY	BLANCO	ELLENBURGER-SAN SABA	The city's wells draw-down level is at or below 50% of original capacity, or recharge has slowed and/or when pumping time from wells meets or exceeds 80% of one day (24 hours) or 18.5 hours for three consecutive days.	20% reduction in demand	Draw-down level dropped to 35% of specific capacity and/or when pumping time from wells meets or exceeds 80% of one day (24 hours) or 20.0 hours for three days.	50% reduction in demand
JONESTOWN WSC	TRAVIS	HIGHLAND LAKES	1. Treatment Capacity: • Total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days, or 97% on a single day; or 2. Water Supply: • Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or • The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	Minimum 20% reduction in use	1. Treatment Capacity: • Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2. Water Supply: • Natural or man-made contamination of the water supply source; or • Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	As determined by the LCRA Board

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
KELLY LANE WCID 1	TRAVIS	CARRIZO-WILCOX	a. The average daily water consumption reaches 90% of the District's water supply/distribution capacity and continues for three consecutive days; b. the combined storage of the Highland Lakes falls to 700,000 acre feet; c. a major component of the water system fails; d. the District Manager and/or his/her designees considers it necessary; e. required under any District water supply contract or the Consent Agreement; or f. otherwise approved by the Board.	25% reduction in average daily use	a. the combined storage of the Highland Lakes reaches 600,000 acre feet or Lake Pflugerville is down to its 625 elevation; b. there is a failure of water treating facilities or transmission system affecting the capability of providing water service; c. there is a contamination of water source; d. system demand exceeds pumping capacity; e. the District Manager and/or his/her designees considers it necessary; f. required under any District water supply contract or the Consent Agreement; or g. otherwise approved by the Board.	75% reduction in average daily use
KEMPNER WSC	BURNET	BRAZOS RIVER AUTHORITY LITTLE RIVER LAKE	Daily water demand exceeds 100% of treatment or distribution capacity for 3 consecutive days.	30% reduction in use	Major water production or distribution limitations Supply Source Contamination System outage due to failure of major water system components.	Achieve necessary reduction in water use
KINGSLAND WSC	BURNET	HIGHLAND LAKES	When KWSC delivers water at the rate of 85% capacity for seven consecutive days or LCRA declares a Stage 2 drought condition.	Reduce Treated Surface Water by 10-20%.	When the emergency situation in KWSC system is in danger of causing immediate health or safety hazard or LCRA declares Stage 3 drought conditions.	Reduce Treated Surface Water by 20%, or more.
KINGSLAND WSC	LLANO	HIGHLAND LAKES and OTHER AQUIFER	When KWSC delivers water at the rate of 85% capacity for seven consecutive days or LCRA declares a Stage 2 drought condition.	Reduce Treated Surface Water by 10-20%.	When the emergency situation in KWSC system is in danger of causing immediate health or safety hazard or LCRA declares Stage 3 drought conditions.	Reduce Treated Surface Water by 20%, or more.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
LA GRANGE	FAYETTE	QUEEN CITY and SPARTA	(a) Average daily water consumption reaches 110% of production capacity (1,760,000 gpd); (b) Average daily water consumption will not enable storage levels to be maintained; (c) System demand exceeds available high service pump capacity; (d) Any two conditions listed in moderate drought classification occurs at the same time for a 24 hour period; (e) Water system is contaminated either accidentally or intentionally; or (f) Water system fails -- from acts of God (tornadoes, hurricanes, or other natural disasters) or man-made. Severe condition is reached immediately upon detection.	5%	(a) Average daily water consumption reaches 110% of production capacity (1,760,000 gpd); (b) Average daily water consumption will not enable storage levels to be maintained; (c) System demand exceeds available high service pump capacity; (d) Any two conditions listed in moderate drought classification occurs at the same time for a 24 hour period; (e) Water system is contaminated either accidentally or intentionally; or (f) Water system fails -- from acts of God (tornadoes, hurricanes, or other natural disasters) or man-made. Severe condition is reached immediately upon detection.	5%

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
LAGO VISTA	TRAVIS	HIGHLAND LAKES	(i) Treatment Capacity. When total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days, or 97% on a single day; or (ii) Water Supply. When combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or when the LCRA board declares a drought worse than the drought of record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	Minimum 20% reduction in use	(i) Treatment Capacity. Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in the ability to provide water service. (ii) Water Supply. Natural or manmade contamination of the water supply source; or any other emergency water supply or demand conditions that the LCRA general manager or the LCRA board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	As determined by the LCRA Board

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
LAKEWAY MUD	TRAVIS	HIGHLAND LAKES	1) Treatment Capacity: When total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days, or 97% on a single day; or 2) Water Supply: Combined storage of Lakes Travis and Buchanan reaches 900,000 acre-feet, in accordance with the LCRA DCP.	Minimum 15% reduction in use	1) Treatment Capacity: Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2) Water Supply: Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP. The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies. Natural or man-made contamination of the water supply source; or Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	Minimum 20% reduction in use

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
LEANDER	TRAVIS	HIGHLAND LAKES	1. Treatment capacity: (a) When total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days, or 97% on a single day; or (b) Pump hours per day of 22 hours. 2. Water supply: (a) Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP; or (b) The LCRA board declares a drought worse than the drought of record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	20% reduction in water use and 17 pump hours per day	1. Treatment capacity: (a) Major water line breaks or pump system failures that cause substantial loss of ability to provide water service; (b) When total daily water demands equal or exceed 100% of the total operating system treatment capacity; or (c) Pump hours per day of 24 hours. 2. Water supply: (a) Natural or man-made contamination of the water supply source; or (b) Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA board determines that either constitutes a water supply emergency or is associated with the LCRA board declaration of a drought worse than the drought of record.	Water use reduction target is less than or equal to 90% of treatment capacity and less than 22 pump hours per day.
LEE COUNTY WSC	BASTROP	CARRIZO-WILCOX AQUIFER	Continually falling treated water storage levels which do not refill above 70% overnight	20% reduction	Continually falling treated water storage levels which do not refill above 60% overnight	30% reduction
LEE COUNTY WSC	FAYETTE	CARRIZO-WILCOX AQUIFER	Continually falling treated water storage levels which do not refill above 70% overnight	20% reduction	Continually falling treated water storage levels which do not refill above 60% overnight	30% reduction

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
LLANO	LLANO	HIGHLAND LAKES and LLANO LAKE	1. The 7-day moving average daily discharge of Llano River at Llano is equal to or less than 21 cubic feet per second (cfs) and the Stage 3 pumpage goal is exceeded for 4 consecutive days. If Stage 2 has not been initiated, the Stage 3 requirements for initiation shall initiate Stage 2 restrictions for 7 days prior to initiating Stage 3. If the Stage 3 pumpage goal can be met within those 7 days, Stage 2 restrictions remain in effect until both requirements for initiation of this section are met; or 2. The Goal for Stage 2 cannot be met under Stage 2 Restriction.	Limit the daily pumpage at the water treatment plant to 0.8 million gallons per day.	1. The 7-day moving average daily discharge of Llano River at Llano is equal to or less than 10 cubic feet per second (cfs) and the Stage 4 pumpage goal is exceeded for 4 consecutive days. If Stage 3 has not been initiated, the Stage 4 requirements for initiation shall initiate Stage 3 restrictions for 7 days prior to initiating Stage 4. If the Stage 4 pumpage goal can be met within those 7 days, Stage 3 restrictions shall remain in effect until both requirements for initiation of this section are met. If Stage 2 has not been initiated, the Stage 4 requirements for initiation shall initiate Stage 2 restrictions for 7 days. If the Stage 4 pumpage goal cannot be met within those 7 days, Stage 3 restrictions sale be initiated. If the Stage 4 pumpage goal cannot be met within 7 days, Stage 4 shall be initiated. If the Stage 4 pumpage goal can be met with the restrictions of Stage 2 or Stage 3, those restrictions shall remain in effect until both requirements for initiation of this section are met; or 2. The goal for Stage 3 cannot be met under Stage 3 Restriction	Limit the daily pumpage at the water treatment plant to 0.6 million gallons per day.
LOOP 360 WSC	TRAVIS	HIGHLAND LAKES	NA	NA	NA	NA
Lost Pines GCD	BASTROP		GCD monitors rainfall and water level records to determine drought conditions impact on aquifers			

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
MANOR	TRAVIS	OTHER AQUIFER, CITY OF AUSTIN - ROR (MUNICIPAL), and HIGHLAND LAKES	NA	NA	(A) If the city manager determines that the available capacity of the Highland Lakes Reservoir is less than the City of Austin's anticipated demand; (B) Whenever water production from the other well fields in Manor drops below 350,000 gallons per day; (C) Whenever the city's ability to take 1,000,000 gallons per day from all sources (including but not limited to the City of Austin, water from the well fields on Gilbert Lane in Manor and other water supply sources) per day drops; and/or (D) The combined water storage levels of Lake Travis and Buchanan are less than 681,000 acre-feet.	NA
MANVILLE WSC	TRAVIS	HIGHLAND LAKES, EDWARDS-BFZ AQUIFER, OTHER AQUIFER, and COLORADO RUN-OF-RIVER	Failure of major component of system or health/safety hazard; or water demand exceeds capacity for 24 hours; or production is 100% and storage tank levels are decreasing at 5% per day; or total production of wells fall by an additional 15%.	15% reduction in use	1. Major water line breaks, or pump or system failures occur, which cause an unprecedented loss of capability to provide water service; or 2. Natural or man-made contamination of the water supply source(s).	To be determined

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
MARBLE FALLS	BURNET	HIGHLAND LAKES	When any of the following condition(s) exist: or as determined by the mayor or his/her designee. (1) When, combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA DCP, or the LCRA Board declares a drought worse than the drought of record and a mandatory curtailment of firm water supplies, and notification is received requesting initiation of Stage 3 of the drought contingency plan. (2) When total daily water demands equals or exceeds 95% of plant capacity for two (2) consecutive days of 96% of plant capacity on a single day. (3) Continually falling treated water reservoir levels that do not refill above 75% overnight. (4) Region-wide drought caused by widespread, long term shortages.	Minimum of 20% reduction in daily demand	When the mayor or his/her designee, determines that a water supply emergency exists based on: (1) When, pursuant to requirements specified in the city's wholesale water purchase contract with LCRA notification is received requesting initiation of Stage 4 of the drought contingency plan. (2) Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or (3) Natural or manmade contamination of the water supply source. (4) Region-wide drought caused by widespread, long term shortages.	Minimum 25% reduction in daily demand
MARKHAM MUD	MATAGORDA	GULF COAST AQUIFER	NA	NA	NA	NA
MATAGORDA COUNTY WCID 6	MATAGORDA	GULF COAST AQUIFER	NA	NA	NA	NA
MATAGORDA WASTE DISPOSAL & WSC	MATAGORDA	GULF COAST AQUIFER	NA	NA	NA	NA

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
MEADOWLAKES	BURNET	OTHER LOCAL SUPPLY and HIGHLAND LAKES	1. Treatment Capacity: (a) When total daily demand equals or exceeds 90% of the total operating system treatment capacity for three consecutive days or 95% on a single day; or (b) Continually falling treated water reservoir levels that do not refill above 60% overnight; or 2. Water Supply: When the combined storage level of Lake Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP or when the LCRA Board declares a drought worse than the Drought of Record currently exists.	20% reduction	1. Treatment Capacity: Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or 2. Water Supply: (a) Natural or man-made contamination of the water supply source(s); or (b) Any other emergency water supply or demand conditions that the LCRA or the City determines constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse that the drought of record.	70% reduction
NORTH AUSTIN MUD 1	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL)	(a) Daily demand exceeds 95% of supply/distribution or pump capacity for 3 consecutive days; or (b) Other causes as determined by the District Manager or designee.	15% reduction	(a) Failure of water treatment facilities; (b) Natural or man-made contamination of the water supply source; or (c) System outage due to failure of major water system components.	Achieve necessary reduction in daily water demand.
NORTH AUSTIN MUD 1	WILLIAMSON	CITY OF AUSTIN - ROR (MUNICIPAL)	(a) Daily demand exceeds 95% of supply/distribution or pump capacity for 3 consecutive days; or (b) Other causes as determined by the District Manager or designee.	15% reduction	(a) Failure of water treatment facilities; (b) Natural or man-made contamination of the water supply source; or (c) System outage due to failure of major water system components.	Achieve necessary reduction in daily water demand.
NORTH SAN SABA WSC	SAN SABA	ELLENBURGER-SAN SABA	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
NORTHTOWN MUD	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL)	a. system demand exceeds available high service pump capacity; b. water system is contaminated, whether accidentally or intentionally (severe condition is reached immediately upon detection of contamination); c. water system fails due to an act of God (tornadoes, hurricanes) or man (severe condition is reached immediately upon detection of the failure); d. any mechanical failure of pumping equipment which will require more than 12 hours to repair and which causes unprecedented loss of capability to provide water service; e. the District Manager and/or his/her designees considers it necessary; f. required by a Water Supplier or under any District water supply contract; or g. otherwise required by the Board.	15% reduction in use	District may impose additional water restrictions to protect the public health and safety in the event of an unusual water system operational event, catastrophic occurrence or severe weather event, or as otherwise required by the Board or a Water Supplier under any District water supply contract.	To be determined.
OAK SHORES WATER SYSTEM	TRAVIS	TRINITY AQUIFER	NA	NA	NA	NA
PALACIOS	MATAGORDA	GULF COAST AQUIFER	To be determined by Mayor.	To be determined by Mayor.	To be determined by Mayor.	To be determined by Mayor.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
PFLUGERVILLE	TRAVIS	HIGHLAND LAKES	Average daily water consumption reaches 90% of production/distribution capacity for a period of 3 consecutive days; or the combined storage of the Highland Lakes falls to 700,000 acre-feet or the city manager determines that stage 3 implementation is necessary to protect the city's water supply for essential usages.	25% reduction in use	(a) The combined storage of the Highland Lakes reaches 600,000 acre-feet or Lake Pflugerville is down to its 625 elevation; (b) Major water line breaks, or pump or system failures occur, and cause unexpected loss of capability to provide water service; (c) System demand exceeds available high service pump capacity; (d) There is detection of accidental or intentional contamination of the water system; (e) There is detection of water systems failure from acts of God (e.g., tornados, hurricanes, etc.) or man; (f) A mechanical failure of pumping equipment occurs during a moderate drought and will require more than 12 hours to repair; or (g) Implementation is necessary under the city's wholesale water contract with the Lower Colorado River Authority.	30% reduction in average use from a rolling 12-month period

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
POLONIA WSC	BASTROP	CARRIZO-WILCOX AQUIFER	South: a. Total daily water demand equals or exceeds 0.450 million gallons for 3 consecutive days or 0.500 million gallons on a single day (e.g., based on the "safe" operating capacity of water supply facilities). b. The water level in any storage tank cannot be replenished for 4 consecutive days. North: a. Total daily water demand equals or exceeds 1.0 million gallons for 3 consecutive days or 1.080 million gallons on a single day (e.g., based on the "safe" operating capacity of water supply facilities). b. The water level in any storage tank cannot be replenished for 4 consecutive days.	South: Achieve a 20% reduction from the 450,000 gallon daily water demand. North: Achieve a 20% reduction from the 1,080,000 gallon daily water demand.	The President, or his/her designee, determines that a water supply emergency exists based on: a. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or b. Other unforeseen events, which could cause imminent health or safety risk to the public.	Achieve a reduction in total water use so that public health, safety, and welfare conditions do not exist.
RICHLAND SUD	SAN SABA	ELLENBURGER-SAN SABA	NA	NA	NA	NA
ROLLINGWOOD	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL)	Defer to City of Austin		Defer to City of Austin	

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
ROUGH HOLLOW IN TRAVIS COUNTY	TRAVIS	CARRIZO-WILCOX, CITY OF AUSTIN - ROR (MUNICIPAL), EDWARDS-BFZ, HIGHLAND LAKES, and TRINITY	1. Total daily water consumption equals or exceeds 95% of the District's water supply/distribution capacity for three consecutive days, or 97% on a single day; 2. Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet in accordance with the LCRA DCP; 3. The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies; 4. System demand exceeds available high service pump capacity; 5. The water system is contaminated, whether accidentally or intentionally; 6. The water system fails due to an act of God (tornadoes, hurricanes) or human; 7. Any mechanical failure of pumping equipment which will require more than 12 hours to repair and which causes unprecedented loss of capability to provide water service; 8. Required under any District water supply contract; or 9. As otherwise determined by the Board or the District Manager, but in no case in conditions less stringent than provided above.	Limit daily water consumption to no more than 80% of the District's water supply/distribution capacity for three consecutive days, or 85% of the District's water supply/distribution capacity for a single day, and achieve a minimum 20% reduction in water use.	1. There is a failure of water treating facilities; 2. There is a major water line break, loss of distribution pressure, or pump system failure that causes substantial loss in the District's ability to provide water service; 3. There is contamination of the water supply source; 4. Any other emergency water supply or demand condition exists that the LCRA General Manager or the LCRA Board of Directors' declaration of a drought worse than the drought of record; 5. Required under any Dirstrict water supply contract; or 6. As otherwise determined by the Board or the District Manager but in no conditions less stringent than provided above.	Achieve a minimum 25% reduction in water use.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
ROUND ROCK	TRAVIS	EDWARDS-BFZ	1. Supply-based trigger for implementation of stage II is as follows: a. Lake Georgetown Reservoir elevation is below 765 feet above mean sea level (msl) for three consecutive days; or b. The combined storage of Lake Georgetown and Lake Stillhouse Hollow is less than 105,001 acre feet of water. 2. Demand or capacity-based triggers for implementation of stage II are as follows: a. Water treatment capacity has reached 90% for three consecutive days; b. Total daily demand has reached 90% of the raw water pumping capacity for three consecutive days; c. Total daily demand is 90% of storage capacity for three consecutive days; d. Total daily demand is 90% of the treated water pumping capacity for three consecutive days; or e. Production or distribution limitations including, but not limited to system outages or equipment failure. 3. Wholesale water suppliers' triggers: a. Pursuant to requirements specified in the city's wholesale water supply contract(s), notification is received from the city's wholesale water supplier(s) requesting implementation of the stage II restrictions. 4. Public health, safety and welfare triggers: a. The city manager makes a written public announcement that he has reasonably determined that	Stage II regulations are intended to achieve a 25% reduction in daily water consumption.	1. Supply-based trigger for implementation of stage III is as follows: a. The combined storage of Lake Georgetown and Lake Stillhouse Hollow is less than 52,501 acre feet of water. 2. Demand or capacity-based triggers for implementation of stage III are as follows: a. Water treatment capacity has reached 95% for three consecutive days; b. Total daily demand has reached 95% pumping capacity for three consecutive days; c. Total daily demand is 95% of the storage capacity for three consecutive days; or d. Significant production or distribution limitations including, but not limited to, system outages and equipment failure. 3. Wholesale water suppliers' triggers: a. Pursuant to requirements specified in the city's wholesale water supply contract(s), notification is received from the city's wholesale water supplier(s) requesting implementation of the stage III restrictions.	Stage III regulations are intended to achieve a 50% reduction in daily water consumption.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
SAN SABA	SAN SABA	ELLENBURGER-SAN SABA AQUIFER	Average daily consumption 110% of rated capacity or consumption will not let storage levels be maintained; Demand exceeds available high service pump capacity; any two conditions in "moderate drought" occur at the same time for 24 hour period;	50% reduction in demand	System is contaminated; system fails from acts of God	To be determined
SCHULENBURG	FAYETTE	YEGUA-JACKSON and GULF COAST	Total daily water demand equals or exceeds 70% of the total well capacity or firm booster pump capacity, whichever is less, for three (3) consecutive days.	Achieve a reduction in water use to reduce demand to less than 70% of the total well capacity or of firm booster pump capacity.	When mayor, city administrator, or their designee, determines that a water supply emergency exists based on: (i) Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or (ii) Natural or manmade contamination of the water supply source(s).	Achieve a reduction in water use to reduce demand to less than 75% of the total well capacity or of firm booster pump capacity or to reduce water use to prevent more than 50% depletion of stored water volumes at any time.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
SENNA HILLS MUD	TRAVIS	HIGHLAND LAKES	1. Treatment Capacity: For surface water systems, when total daily water demand equals or exceeds 95% of the total operating system treatment capacity for three consecutive days, or 97% on a single day. 2. Water Supply: Combined storage of Lakes Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or the LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	Minimum 20% reduction in use	1. Treatment Capacity: Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2. Water Supply: Contamination of the water supply source; or any other emergency water supply or demand conditions that the WTCPUA Water Services executive manager, or designee, determines to constitute a water supply emergency more severe than that contemplated in the triggers contained in the LCRA Water Management Plan.	Minimum 30% reduction in use
SHADY HOLLOW MUD	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL)	Defer to City of Austin		Defer to City of Austin	
SMITHVILLE	BASTROP	CARRIZO-WILCOX AQUIFER	When (either, any of) the following condition(s) exist: (ii) When the specific capacity of the city's well is equal to or less than 75% of the well's pumping capability. (iii) When total daily water demand equals or exceeds 1.9 million gallons for 3 consecutive day or 2.0 million gallons on a single day.	20% reduction in demand	The mayor, or his/her designee, determines that a water supply emergency exists based on: (i) Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or (ii) Natural or man-made contamination of the water supply source(s).	30% reduction in use

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
SUNRISE BEACH VILLAGE	LLANO	HIGHLAND LAKES and HICKORY	a. For surface water supply systems, when total daily water demand equals or exceeds 95% of: i. the total design capacity of the SRB water treatment plant for three consecutive days, or 97% on a single day; or ii. the contracted peak day capacity for systems supplied by another provider; or b. For groundwater supply systems, when maximum daily usage equals or exceeds 95% of the pump's or well's rated capacity, whichever is less, for three consecutive days; or c. When the drought contingency measures of the LCRA Water Management Plan require that firm water customers curtail water use on a pro rata basis.	Minimum 20% reduction in use	a. Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service, b. Contamination of the water supply source, c. Any other emergency water supply or demand conditions that the SRB Mayor or designee determines to constitute a water supply emergency more severe than that contemplated in the triggers contained in the SRB Water Management Plan. d. LCRA determination that a drought worse than the drought of record resulting in inflows and lake levels dropping below critical levels exist and warrant emergency procedures be implemented.	As determined by the SRB City Council.
SUNSET VALLEY	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL) and EDWARDS-BFZ	A system failure or contamination of the City Groundwater Well or Water Plant, a declaration of Stage II Drought by the City of Austin, a declaration of Alarm Stage Drought by the Barton Springs Edwards Aquifer District and/or when the drought contingency measures of the LCRA Water Management Plan request that firm water customers voluntarily implement mandatory water restrictions.	20% reduction in monthly water usage per commercial meter based on 3 year rolling average. Achieve a maximum residential monthly consumption of the greater of 12,000 gallons/connection or 4,000 gallons/capita.	A system failure or contamination of the City Groundwater Well or Water Plant and/or a declaration of Stage III Drought by the City of Austin, a declaration of Critical Stage Drought by the Barton Springs Edwards Aquifer District, and/or when the drought contingency measures of the LCRA Water Management Plan require that firm water customers curtail water use on a pro rata basis.	30% reduction in monthly water usage per commercial meter based on 3 year rolling average. Achieve a maximum residential monthly consumption of the greater of 9,000 gallons/connection or 3,000 gallons/capita.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
SWEETWATER COMMUNITY	TRAVIS	HIGHLAND LAKES	(a) Treatment Capacity: -When total daily water demand equals or exceeds 95 percent of the total operating system treatment capacity for three consecutive days, or 97 percent on a single day. (b) Water Supply -Combined storage of Lake Travis and Buchanan reaches 600,000 acre-feet, in accordance with the LCRA DCP, or -The LCRA Board declares a drought worse than the Drought of Record or other water supply emergency and orders the mandatory curtailment of firm water supplies.	System Capacity Reduction Target: Limit daily water demand to no more than 80% capacity for three days or 85% for one day. Water Supply Reduction Target: Achieve a minimum 20% reduction in water use.	(a) Treatment Capacity: -Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. (b) Water Supply: -Natural or man-made contamination of the water supply source; or -Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse that the drought of record.	Demand Management Goals: Reduce demand by ten percent (10%) from Stage 3 goals for a cumulative reduction of 35%.
TRAVIS COUNTY MUD 10	TRAVIS	HIGHLAND LAKES	When the combined storage for Lakes Travis and Buchanan is at or below 900,000 acre-feet, but above 600,000 acre-feet, and/or the LCRA requests reduced water use by firm stored water customers, the District will implement its Drought Response Measures and declare a Stage III (Orange) condition. The water use reduction goal is 25%.	25% reduction in use	When the combined storage for Lakes Travis and Buchanan is at or below 600,000 acre-feet, and/or the LCRA curtails and distributes the available supply of firm stored water among all of its firm stored water supply customers on a pro rata basis according to their historic demand for stored water during a drought determined to be more severe than the Drought of Record, the District will implement its Drought Response Measures and declare a Stage IV (Red) condition. The water use reduction goal is 35%.	35% reduction in use
TRAVIS COUNTY MUD 14	TRAVIS	CARRIZO-WILCOX	NA	NA	NA	NA

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
TRAVIS COUNTY MUD 2	TRAVIS	CARRIZO-WILCOX	a. the water system is contaminated, whether accidentally or intentionally (Stage 3 may be reached immediately upon detection of contamination); b. the water system fails due to an act of God (tornadoes, hurricanes) or man (Stage 3 may be reached immediately upon detection of the failure); c. any mechanical failure of pumping equipment which will require more than 12 hours to repair and which causes unprecedented loss of capability to provide water service; d. required under any District water supply contract; e. the availability of the District’s water supply is reduced up to a drought of record; or f. otherwise approved by the Board.	30% reduction in average daily use	a. there is a failure of water supply or distribution facilities; b. there is a contamination of water source; c. required under any District water supply contract; d. the District Manager or his/her designee, in consultation with the Board President or Vice President, considers it necessary; or e. otherwise approved by the Board.	40% reduction in average daily use
TRAVIS COUNTY MUD 4	TRAVIS	HIGHLAND LAKES	The District will declare that a severe water shortage condition exists when average daily water consumption reaches 95% of production/distribution capacity for a period of 3 days.	25% reduction in demand	The District will declare that an emergency water shortage condition exists when the Board of Directors determine that Stage 4 implementation is necessary pursuant to requirements specified in the District's wholesale water purchase contract with the Lower Colorado River Authority or when the Board of Directors declares that Stage 4 implementation is necessary due to a system outage or catastrophic equipment failure.	Additional pro-rata curtailment in total water use specified by LCRA.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
TRAVIS COUNTY WCID 10	TRAVIS	HIGHLAND LAKES	Combined storage of Travis/Buchanan at or below 900,000 ac-ft; or LCRA requests reduced water use	25% reduction	Combined storage of Travis/Buchanan at or below 600,000 ac-ft; or LCRA requests reduced water use	As determined by the LCRA Board
TRAVIS COUNTY WCID 17	TRAVIS	HIGHLAND LAKES	1. Any of the Stage 2 triggers are in effect; and 2. The combined storage in lakes Travis and Buchanan drops below 750,000 acre-feet or the Lake Travis level drops to 629 feet.	25% reduction in demand	1. Daily water consumption reaches 110% of treatment capacity; 2. Daily water consumption will not allow storage levels to be maintained; 3. System demand exceeds available high service pump capacity; 4. The drought contingency measures of the LCRA Water Management Plan trigger the requirement that municipal firm water customers implement mandatory Stage 3 water restrictions; or 5. The combined storage in lakes Travis and Buchanan drops below 600,000 acre-feet or the Lake Travis level drops to 620 feet or DWDOR is declared by the LCRA.	30-50% reduction in demand
TRAVIS COUNTY WCID 18	TRAVIS	HIGHLAND LAKES	When continually falling water reservoirs in the District result in ground storage tank levels of less than 35% capacities during periods of peak flow or the levels in the ground storage tanks are such as they only provide minimum water pressures at the upper ends of the pressure planes. Stage 3 may also be requested by the wholesale water supplier in periods of supply emergency.	30% reduction in demand	When continually falling levels in any ground storage tank falls below 25% of capacity which results in low pressure in any pressure plane, or as requested by the wholesale water supplier during periods of drought emergency.	40% reduction in demand

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
TRAVIS COUNTY WCID 19	TRAVIS	HIGHLAND LAKES	1. The District Operator is notified by MUD 4 that it is requiring Stage 3 requirements and constrictions which will be when: 1. the average daily water consumption reaches 90% of NruD No. 4's production/distribution capacity for a period of three consecutive days; or 2. the LCRA Board determines that the river system is experiencing a drought more severe than the Drought of Record; or 3. LCRA requires mandatory irrigation restrictions more stringent that Even/Odd Schedules.	Reduce demand by 10-20% and maintain maximum daily water demand at or below 90% of the MUD 4 system capacity.	1. Combined storage in the Highland Lakes falls below 600,000 acre-feet; 2. Daily water consumption reaches 95% of MUD No. 4's production/distribution capacity for a period of three consecutive days; 3. Daily water consumption will not enable storage levels to be maintained; 4. System demand exceeds available high service pump capacity; 5. Water system is contaminated whether accidentally or intentionally. Severe condition is reached immediately upon detection; 6. Water system fails from acts of God (tornadoes, hurricanes) or man. Severe condition is reached immediately upon detection; and/or 7. Any mechanical failure of pumping equipment which will require more than twelve hours to repair which causes unprecedented loss of capability to provide water service; or 8. LCRA requires the MUD No.4 to prohibit all use of permanently installed irrigation system or hose-end irrigation.	The goal for Stage 4 of the Plan is to reduce demand by a minimum of 20% and maintain maximum daily water demand at or below 95% of the MUD 4 system capacity.

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WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
TRAVIS COUNTY WCID 20	TRAVIS	HIGHLAND LAKES	1. Combined storage in the Highland Lakes falls below 600,000 acre-feet; 2. The average daily water consumption reaches 90% of production/distribution capacity for a period of three consecutive days; 3. The LCRA Board of Directors declares a "Drought Worse than Drought of Record" and orders the mandatory curtailment of firm water supplies; 4. LCRA requires mandatory irrigation restrictions more stringent than Even/Odd Schedules; or 5. Required under any District water supply contract	Reduce demand by 10-20% and maintain maximum daily water demand at or below 90% of system capacity.	1. The combined storages in Lakes Buchanan and Travis continues to decrease after the declaration of a Drought Worse than Drought of Record, and the LCRA Board increases the mandatory curtailment of firm water supplies; 2. Daily water consumption reaches 95% of production/distribution capacity for a period of three consecutive days; 3. Daily water consumption will not enable storage levels to be maintained; 4. System demand exceeds available high service pump capacity; 5. Water system is contaminated whether accidentally or intentionally. Severe condition is reached immediately upon detection; 6. Water system fails - from acts of God (tornadoes, hurricanes) or man. Severe condition is reached immediately upon detection; 7. Any mechanical failure of pumping equipment which will require more than twelve hours to repair which causes unprecedented loss of capability to provide water service; or 8. LCRA requires the District to prohibit all use of permanently installed irrigation system or hose-end irrigation; or 9. Required under any District water supply contract.	Reduce demand by a minimum of 20% and maintain maximum daily water demand at or below 95% of system capacity.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
TRAVIS COUNTY WCID POINT VENTURE	TRAVIS	HIGHLAND LAKES	1. Treatment Capacity: The water treatment plant capacity condition listed above as a triggering event for Stage 3 has ceased to exist for five consecutive days; or 2. Water Supply: LCRA announces that mandatory water restrictions for firm water customers are no longer required in accordance with the LCRA DCP.	Water Supply Reduction Target: Achieve a minimum 20% reduction in water use.	1. Treatment Capacity: Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service. 2. Water Supply: Natural or man-made contamination of the water supply source; or Any other emergency water supply or demand conditions that the LCRA general manager or the LCRA Board determines that either constitutes a water supply emergency or is associated with the LCRA Board declaration of a drought worse than the drought of record.	Water Supply Reduction Target: As determined by the LCRA Board.
WEIMAR	COLORADO	GULF COAST AQUIFER	NA	NA	NA	NA
WELLS BRANCH MUD	TRAVIS	CITY OF AUSTIN - ROR (MUNICIPAL)	Defer to City of Austin	15% reduction in total water use	Defer to City of Austin	Achieve necessary reduction in total water use
WELLS BRANCH MUD	WILLIAMSON	CITY OF AUSTIN - ROR (MUNICIPAL)	Defer to City of Austin	15% reduction in total water use	Defer to City of Austin	Achieve necessary reduction in total water use.
WEST END WSC	FAYETTE	YEGUA-JACKSON and GULF COAST	NA	NA	NA	NA

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	HAYS	HIGHLAND LAKES	Either of the following criteria is met: a. For surface water supply systems, when total daily water demand equals or exceeds 85% of: (a) The total design capacity of a WTCPUA water treatment plant for three consecutive days; or (b) The LCRA Board determines a drought worse than the drought of record.	Minimum 20% reduction in use	Include, but are not limited to, the following: (a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; (b) Contamination of the water supply source; or (c) Any other emergency water supply or demand conditions that the WTCPUA General Manager or designee, determines to constitute a water supply emergency more severe than that contemplated in the triggers contained in the LCRA Water Management Plan	As determined by the WTCPUA Board.
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	TRAVIS	HIGHLAND LAKES	Either of the following criteria is met: a. For surface water supply systems, when total daily water demand equals or exceeds 85% of: (a) The total design capacity of a WTCPUA water treatment plant for three consecutive days; or (b) The LCRA Board determines a drought worse than the drought of record.	Minimum 20% reduction in use	Include, but are not limited to, the following: (a) Major water line breaks, loss of distribution pressure, or pump system failures that cause substantial loss in its ability to provide water service; (b) Contamination of the water supply source; or (c) Any other emergency water supply or demand conditions that the WTCPUA General Manager or designee, determines to constitute a water supply emergency more severe than that contemplated in the triggers contained in the LCRA Water Management Plan	As determined by the WTCPUA Board.

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
WHARTON	WHARTON	GULF COAST AQUIFER	Total daily for three consecutive days 3.75 MGD or 4.0 MGD on a single day.	20% reduction in demand	1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or 2. Natural or manmade contamination of the water supply source(s).	25% reduction in demand
WHARTON COUNTY WCID 2	WHARTON	GULF COAST AQUIFER	NA	NA	NA	NA
WILLIAMSON COUNTY WSID 3	TRAVIS	EDWARDS-BFZ	1. Failure of a major component of the system or an events that would cause an immediate health or safety hazard; 2. Water consumption exceeds the District's water supply/distribution capacity for more than 24 hours; 3. Production of Manville's water wells is at 100% and storage tank levels are decreasing at a rate exceeding 5% per day; 4. Total production of Manvillle's water well drops by an additional 15%; or 5. Otherwise required under the District's agreements with Manville.	15% reduction in use	1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; 2. Natural or man-made contamination of the water supply source(s); or 3. When required under the District's agreements with Manville.	75% reduction in use

Existing Drought Trigger Summary for 2021 Region K Water Plan (Updated November 2019)

WUG Name	County	Source Name	Severe Water Shortage		Critical/Emergency Water Shortage	
			Trigger	Goal	Trigger	Goal
WILLIAMSON TRAVIS COUNTIES MUD 1	TRAVIS	HIGHLAND LAKES	1. Daily water consumption exceeds 95% of operating system capacity for three consecutive days; and/or the combined storage is less than 750,000 acre feet but greater than 550,000 acre feet, which typically corresponds to an elevation in Lake Travis of 618 feet; 2. Required under the District‘s wholesale water contract with the City of Cedar Park.	Minimum 20% reduction in use	1. Daily water consumption reaches 95% of production/distribution capacity for three consecutive days; and/or the combined storage reaches 200,000 acre-feet, which typically corresponds to an elevation in Lake Travis of 578 feet; 2. Daily water consumption will not enable storage levels to be maintained; 3. System demands exceed available high service pump capacity; 4. Water system is contaminated whether accidentally or intentionally. Severe condition is reached immediately upon detection; 5. Water system fails from acts of God (tornadoes, hurricanes) or man. Severe condition is reached immediately upon detection; 6. Any mechanical failure of pumping equipment which will require more than 12 hours to repair which causes unprecedented loss of capability to provide water service. 7. Required under the District’s Wholesale Water Contract with the City of Cedar Park.	Minimum 30% reduction in use
WINDERMERE UTILITY	TRAVIS	EDWARDS-BFZ	If the system meets supply or demand triggers identified in Section 9 of this plan or critical system capacities are threatened, the Utility will activate Stage II.	Reduce water consumption and usage by 20% through mandatory restrictions.	If the system meets supply or demand triggers identified in Section 9 of this plan or critical system capacities are threatened or system failures are imminent, the Utility will activate Stage III.	Reduce water consumption and usage by 30% through mandatory restrictions.

APPENDIX 7B

Region-Specific Model Drought Contingency Plans

Model Region K Drought Contingency Plan Template

Utility/Water Supplier

Model Drought Contingency Plan Template (Utility / Water Supplier)

Brief Introduction and Background

Include information such as
- Name of Utility
- Address, City, Zip Code
- CCN#
- PWS #s

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the ____________________ (name of your water supplier) hereby adopts the following regulations and restrictions on the delivery and consumption of water through an ordinance/or resolution.

Water uses regulated or prohibited under this Drought Contingency Plan (the Plan) are considered to be non-essential and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to penalties as defined in Section XI of this Plan.

Section II: Public Involvement

Opportunity for the public to provide input into the preparation of the Plan was provided by the _______________ (name of your water supplier) by means of _________________ (describe methods used to inform the public about the preparation of the plan and provide opportunities for input; for example, scheduling and providing public notice of a public meeting to accept input on the Plan).

Section III: Public Education

The _______________ (name of your water supplier) will periodically provide the public with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of ___________________ (describe methods to be used to provide information to the public about the Plan; for example, public events, press releases or utility bill inserts).

Section IV: Coordination with the Lower Colorado Regional Water Planning Group

The service area of the ______________ (name of your water supplier) is located within the Lower Colorado Regional Water Planning Area and ____________ (name of your water supplier) has provided a copy of this Plan to the Lower Colorado Regional Water Planning Group.

Section V: Authorization

The ____________________ (designated official; for example, the mayor, city manager, utility director, general manager, etc.), or his/her designee is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The ________________, (designated official) or his/her designee shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all persons, customers, and property utilizing water provided by the ___________________ (name of your water supplier). The terms person and customer as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Definitions

For the purposes of this Plan**,** the following definitions shall apply:

Aesthetic water use: water use for ornamental or decorative purposes such as fountains, reflecting pools, and water gardens.

Commercial and institutional water use: water use which is integral to the operations of commercial and non-profit establishments and governmental entities such as retail establishments, hotels and motels, restaurants, and office buildings.

Conservation: those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water or increase the recycling and reuse of water so that a supply is conserved and made available for future or alternative uses.

Customer: any person, company, or organization using water supplied by __________________ (name of your water supplier).

Domestic water use: water use for personal needs or for household or sanitary purposes such as drinking, bathing, heating, cooking, sanitation, or for cleaning a residence, business, industry, or institution.

Even number address: street addresses, box numbers, or rural postal route numbers ending in 0, 2, 4, 6, or 8 and locations without addresses.

Industrial water use: the use of water in processes designed to convert materials of lower value into forms having greater usability and value.

Landscape irrigation use: water used for the irrigation and maintenance of landscaped areas, whether publicly or privately owned, including residential and commercial lawns, gardens, golf courses, parks, and rights-of-way and medians.

Non-essential water use: water uses that are not essential nor required for the protection of public, health, safety, and welfare, including:

(a) irrigation of landscape areas, including parks, athletic fields, and golf courses, except otherwise provided under this Plan;
(b) use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle;
(c) use of water to wash down any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
(d) use of water to wash down buildings or structures for purposes other than immediate fire protection;
(e) flushing gutters or permitting water to run or accumulate in any gutter or street;
(f) use of water to fill, refill, or add to any indoor or outdoor swimming pools or Jacuzzi-type pools;
(g) use of water in a fountain or pond for aesthetic or scenic purposes except where necessary to support aquatic life;
(h) failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s); and
(i) use of water from hydrants for construction purposes or any other purposes other than fire fighting.

Odd numbered address: street addresses, box numbers, or rural postal route numbers ending in 1, 3, 5, 7, or 9.

Section VIII: Criteria for Initiation and Termination of Drought Response Stages

The ________________ (designated official) or his/her designee shall monitor water supply and/or demand conditions on a __________ (example: daily, weekly, monthly) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan, that is, when the specified triggers are reached.

The triggering criteria described below are based on ______________________________________
____
(*provide a brief description of the rationale for the triggering criteria; for example, triggering criteria / trigger levels based on a statistical analysis of the vulnerability of the water source under drought of record conditions, or based on known system capacity limits*).

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation

Customers shall be requested to voluntarily conserve water and adhere to the prescribed restrictions on certain water uses, defined in Section VII Definitions, when

____

(*Describe triggering criteria / trigger levels; see examples below*).

> *Following are examples of the types of triggering criteria that might be used in one or more successive stages of a drought contingency plan. One or a combination of such criteria must be defined for each drought response stage, but usually not all will apply. Select those appropriate to your system:*

Example 1: *Annually, beginning on May 1 through September 30.*

Example 2: *When the water supply available to the _______ (name of your water supplier) is equal to or less than _______ (acre-feet, percentage of storage, etc.).*

Example 3: *When, pursuant to requirements specified in the _____________(name of **your** water supplier) wholesale water purchase contract with ____________ (name of your wholesale water supplier), notification is received requesting initiation of Stage 1 of the Drought Contingency Plan.*

Example 4: *When flows in the _______ (name of stream or river) are equal to or less than ____cubic feet per second.*

Example 5: *When the static water level in the ____________ (name of your water supplier) well(s) is equal to or less than _____ feet above/below mean sea level.*

Example 6: *When the specific capacity of the __________________ (name of your water supplier) well(s) is equal to or less than _____ percent of the well's original specific capacity.*

Example 7: *When total daily water demand equals or exceeds ______ million gallons for ___consecutive days of ____ million gallons on a single day (example: based on the safe operating capacity of water supply facilities).*

Example 8: *Continually falling treated water reservoir levels which do not refill above __ percent overnight (example: based on an evaluation of minimum treated water storage required to avoid system outage).*

The public water supplier may devise other triggering criteria which are tailored to its system.

Requirements for termination
Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g. 3) consecutive days.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses provided in Section IX of this Plan when _____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (example: 3) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 3 of this Plan when _____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (example: 3) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions on certain non-essential water uses for Stage 4 of this Plan when _____________ (*describe triggering criteria; see examples in Stage 1*).

Requirements for termination
Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (example: 3) consecutive days. Upon termination of Stage 4, Stage 3 becomes operative.

Stage 5 Triggers -- EMERGENCY Water Shortage Conditions

Requirements for initiation
Customers shall be required to comply with the requirements and restrictions for Stage 5 of this Plan when _____________ (designated official), or his/her designee, determines that a water supply emergency exists based on:

1. Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; **or**

2. Natural or man-made contamination of the water supply source(s).

Requirements for termination
Stage 5 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (example: 3) consecutive days.

Stage 6 Triggers -- WATER ALLOCATION

Requirements for initiation
Customers shall be required to comply with the water allocation plan prescribed in Section IX of this
Plan and comply with the requirements and restrictions for Stage 5 of this Plan when _____________ (describe triggering criteria, see examples in Stage 1).

Requirements for termination - Water allocation may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (example: 3) consecutive days.

Note: The inclusion of WATER ALLOCATION as part of a drought contingency plan may not be required in all cases. For example, for a given water supplier, an analysis of water supply availability under drought of record conditions may indicate that there is essentially no risk of water supply shortage. Hence, a drought contingency plan for such a water supplier might only address facility capacity limitations and emergency conditions (example: supply source contamination and system capacity limitations).

Section IX: Drought Response Stages

The ________________ (designated official), or his/her designee, shall monitor water supply and/or demand conditions on a daily basis and, in accordance with the triggering criteria set forth in Section VIII of this Plan, shall determine that a mild, moderate, severe, critical, emergency or water shortage condition exists and shall implement the following notification procedures:

Notification
Notification of the Public:
The _________ (designated official) or his/ her designee shall notify the public by means of:

Examples:
publication in a newspaper of general circulation,
direct mail to each customer,
public service announcements,
signs posted in public places
take-home fliers at schools.

<u>Additional Notification</u>:
The **_________** (designated official) or his/ her designee shall notify directly, or cause to be notified directly, the following individuals and entities:

Examples:
Mayor / Chairman and members of the City Council / Utility Board
Fire Chief(s)
City and/or County Emergency Management Coordinator(s)
County Judge & Commissioner(s)
State Disaster District / Department of Public Safety
TCEQ *(required when* mandatory *restrictions are imposed)*
Major water users
Critical water users, i.e. hospitals
Parks / street superintendents & public facilities managers

Note: The plan should specify direct notice only as appropriate to respective drought stages.

Stage 1 Response -- MILD Water Shortage Conditions

<u>Target</u>: Achieve a voluntary ___ percent reduction in __________(example: total water use, daily water demand, etc.).

<u>Best Management Practices for Supply Management</u>:

D*escribe additional measures, if any, to be implemented directly by (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, activation and use of an alternative supply source(s); use of reclaimed water for non-potable purposes.*

<u>Voluntary Water Use Restrictions for Reducing Demand</u>:

(a) Water customers are requested to voluntarily limit the irrigation of landscaped areas to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and to irrigate landscapes only between the hours of midnight and 10:00 a.m. and 8:00 p.m. to midnight on designated watering days.

(b) All operations of the **_______________** (name of your water supplier) shall adhere to water use restrictions prescribed for Stage 2 of the Plan.

(c) Water customers are requested to practice water conservation and to minimize or discontinue water use for non-essential purposes.

Stage 2 Response -- MODERATE Water Shortage Conditions

Target: Achieve a ___ percent reduction in __________ (example: total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ____________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Demand Reduction:

Under threat of penalty for violation, the following water use restrictions shall apply to all persons:

(a) Irrigation of landscaped areas with hose-end sprinklers or automatic irrigation systems shall be limited to Sundays and Thursdays for customers with a street address ending in an even number (0, 2, 4, 6 or 8), and Saturdays and Wednesdays for water customers with a street address ending in an odd number (1, 3, 5, 7 or 9), and irrigation of landscaped areas is further limited to the hours of 12:00 midnight until 10:00 a.m. and between 8:00 p.m. and 12:00 midnight on designated watering days. However, irrigation of landscaped areas is permitted at anytime if it is by means of a hand-held hose, a faucet filled bucket or watering can of five (5) gallons or less, or drip irrigation system.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight. Such washing, when allowed, shall be done with a hand-held bucket or a hand-held hose equipped with a positive shutoff nozzle for quick rises. Vehicle washing may be done at any time on the immediate premises of a commercial car wash or commercial service station. Further, such washing may be exempted from these regulations if the health, safety, and welfare of the public is contingent upon frequent vehicle cleansing, such as garbage trucks and vehicles used to transport food and perishables.

(c) Use of water to fill, refill, or add to any indoor or outdoor swimming pools, wading pools, or Jacuzzi-type pools is prohibited except on designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) Use of water from hydrants shall be limited to fire fighting, related activities, or other activities necessary to maintain public health, safety, and welfare, except that use of water from designated fire hydrants for construction purposes may be allowed under special permit from the ____________________ (name of your water supplier).

(f) Use of water for the irrigation of golf course greens, tees, and fairways is prohibited except on designated watering days between the hours 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight. However, if the golf course utilizes a water source other than that provided by the _______________ (name of your water supplier), the facility shall not be subject to these regulations.

(g) All restaurants are prohibited from serving water to patrons except upon request of the patron.

(h) The following uses of water are defined as non-essential and are prohibited:

1. wash down of any sidewalks, walkways, driveways, parking lots, tennis courts, or other hard-surfaced areas;
2. use of water to wash down buildings or structures for purposes other than immediate fire protection;
3. use of water for dust control;
4. flushing gutters or permitting water to run or accumulate in any gutter or street; and
5. failure to repair a controllable leak(s) within a reasonable period after having been given notice directing the repair of such leak(s).

Stage 3 Response -- SEVERE Water Shortage Conditions

Target: Achieve a ___ percent reduction in __________ (example: total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ____________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Demand Reduction:
All requirements of Stage 2 shall remain in effect during Stage 3 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 12:00 midnight and 10:00 a.m. and between 8 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, drip irrigation, or permanently installed automatic sprinkler system only. The use of hose-end sprinklers is prohibited at all times.

(b) The watering of golf course tees is prohibited unless the golf course utilizes a water source other than that provided by the ____________________ (name of your water supplier).

(c) The use of water for construction purposes from designated fire hydrants under special permit is to be discontinued.

Stage 4 Response -- CRITICAL Water Shortage Conditions

<u>Target</u>: Achieve a ___ percent reduction in __________ (example: total water use, daily water demand, etc.).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by ____________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

<u>Water Use Restrictions for Reducing Demand:</u>. All requirements of Stage 2 and 3 shall remain in effect during Stage 4 except:

(a) Irrigation of landscaped areas shall be limited to designated watering days between the hours of 6:00 a.m. and 10:00 a.m. and between 8:00 p.m. and 12:00 midnight and shall be by means of hand-held hoses, hand-held buckets, or drip irrigation only. The use of hose-end sprinklers or permanently installed automatic sprinkler systems are prohibited at all times.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle not occurring on the premises of a commercial car wash and commercial service stations and not in the immediate interest of public health, safety, and welfare is prohibited. Further, such vehicle washing at commercial car washes and commercial service stations shall occur only between the hours of 6:00 a.m. and 10:00 a.m. and between 6:00 p.m. and 10 p.m.

(c) The filling, refilling, or adding of water to swimming pools, wading pools, and Jacuzzi-type pools is prohibited.

(d) Operation of any ornamental fountain or pond for aesthetic or scenic purposes is prohibited except where necessary to support aquatic life or where such fountains or ponds are equipped with a recirculation system.

(e) No application for new, additional, expanded, or increased-in-size water service connections, meters, service lines, pipeline extensions, mains, or water service facilities of any kind shall be approved, and time limits for approval of such applications are hereby suspended for such time as this drought response stage or a higher-numbered stage shall be in effect.

Stage 5 Response -- EMERGENCY Water Shortage Conditions

Target: Achieve a ___ percent reduction in __________ (example: total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ____________ (name of your water supplier) to manage limited water supplies and/or reduce water demand. Examples include: reduced or discontinued flushing of water mains, reduced or discontinued irrigation of public landscaped areas; use of an alternative supply source(s); use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand. All requirements of Stage 2, 3, and 4 shall remain in effect during Stage 5 except:

(a) Irrigation of landscaped areas is absolutely prohibited.

(b) Use of water to wash any motor vehicle, motorbike, boat, trailer, airplane or other vehicle is absolutely prohibited.

Section X: Enforcement

(a) No person shall knowingly or intentionally allow the use of water from the __________________ (name of your water supplier) for residential, commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this Plan, or in an amount in excess of that permitted by the drought response stage in effect at the time pursuant to action taken by _____________(designated official), or his/her designee, in accordance with provisions of this Plan.

(b) Any person who violates this Plan is guilty of a misdemeanor and, upon conviction shall be punished by a fine of not less than _______ dollars ($__) and not more than ______ dollars ($__). Each day that one or more of the provisions in this Plan is violated shall constitute a separate offense. If a person is convicted of three or more distinct violations of this Plan, the _____________ (designated official) shall, upon due notice to the customer, be authorized to discontinue water service to the premises where such violations occur. Services discontinued under such circumstances shall be restored only upon payment of a re-connection charge, hereby established at $______, and any other costs incurred by the ___________________ (name of your water supplier) in discontinuing service. In addition, suitable assurance must be given to the ________________ (designated official) that the same action shall not be repeated while the Plan is in effect. Compliance with this plan may also be sought through injunctive relief in the district court.

(c) Any person, including a person classified as a water customer of the ______________ (name of your water supplier), in apparent control of the property where a violation occurs or originates shall be presumed to be the violator, and proof that the violation occurred on the person's property shall constitute a rebuttable presumption that the person in apparent control of the property committed the violation, but any such person shall have the right to show that he/she did not commit the violation. Parents shall be presumed to be responsible for violations of their minor children and proof that a violation, committed by a child, occurred on property within the parents' control shall constitute a rebuttable presumption that the parent committed the violation, but any such parent may be excused if he/she proves that he/she had previously directed the child not to use the water as it was used in violation of this Plan and that the parent could not have reasonably known of the violation.

(d) Any employee of the ________________ (name of your water supplier), police officer, or other _____ employee designated by the ____________ (designated official), may issue a citation to a person he/she reasonably believes to be in violation of this Ordinance. The citation shall be prepared in duplicate and shall contain the name and address of the alleged violator, if known, the offense charged, and shall direct him/her to appear in the ______________ (example: municipal court) on the date shown on the citation for which the date shall not be less than 3 days nor more than 5 days from the date the citation was issued. The alleged violator shall be served a copy of the citation. Service of the citation shall be complete upon delivery of the citation to the alleged violator, to an agent or employee of a violator, or to a person over 14 years of age who is a member of the violator's immediate family or is a resident of the violator's residence. The alleged violator shall appear in _________ (example: municipal court) to enter a plea of guilty or not guilty for the violation of this Plan. If the alleged violator fails to appear in __________ (example: municipal court), a warrant for his/her arrest may be issued. A summons to appear may be issued in lieu of an arrest warrant. These cases shall be expedited and given preferential setting in __________ (example: municipal court) before all other cases.

Section XI: Variances

The _________________ (designated official), or his/her designee, may, in writing, grant temporary variance for existing water uses otherwise prohibited under this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the health, sanitation, or fire protection for the public or the person requesting such variance and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.
(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Ordinance shall file a petition for variance with the __________________ (name of your water supplier) within 5 days after the Plan or a particular drought response stage has been invoked. All petitions for variances shall be reviewed by the __________ (designated official), or his/her designee, and shall include the following:

(a) Name and address of the petitioner(s).
(b) Purpose of water use.

(c) Specific provision(s) of the Plan from which the petitioner is requesting relief.
(d) Detailed statement as to how the specific provision of the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(e) Description of the relief requested.
(f) Period of time for which the variance is sought.
(g) Alternative water use restrictions or other measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(h) Other pertinent information.

EXAMPLE RESOLUTION FOR ADOPTION OF A

DROUGHT CONTINGENCY PLAN

RESOLUTION NO. __________

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE ___________________ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the ____________ (name of water supplier) and its water utility customers are limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the *Texas Water Code* and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the _________________ (name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE _________________ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit "A" and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the ________________ (name of water supplier).

SECTION 2. That the _______________ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE _______________, ON THIS __ day of ______________, 20__.

____

President, Board of Directors
ATTESTED TO:

____
Secretary, Board of Directors

Model Region K Drought Contingency Plan Template

Irrigation Uses

Model Drought Contingency Plan Template (Irrigation Uses)

DROUGHT CONTINGENCY PLAN
FOR
(Name of irrigation district)
(Address)
(Date)

Section I: Declaration of Policy, Purpose, and Intent

The Board of Directors of the ___________________ (name of irrigation district) deems it to be in the interest of the District to adopt Rules and Regulations governing the equitable and efficient allocation of limited water supplies during times of shortage. These Rules and Regulations constitute the District's drought contingency plan required under Section 11.1272, Texas Water Code, *Vernon's Texas Codes Annotated*, and associated administrative rules of the Texas Commission on Environmental Quality (Title 30, Texas Administrative Code, Chapter 288).

Section II: User Involvement

Opportunity for users of water from the _________________ (name of irrigation district) was provided by means of ________________ (describe methods used to inform water users about the preparation of the plan and opportunities for input; for example, scheduling and providing notice of a public meeting to accept user input on the plan).

Section III: User Education

The _____________ (name of irrigation district) will periodically provide water users with information about the Plan, including information about the conditions under which water allocation is to be initiated or terminated and the district's policies and procedures for water allocation. This information will be provided by means of ______________ (e.g. describe methods to be used to provide water users with information about the Plan; for example, by providing copies of the Plan and by posting water allocation rules and regulations on the district's public bulletin board).

Section IV: Authorization

The ______________ (e.g., general manager) is hereby authorized and directed to implement the applicable provision of the Plan upon determination by the Board that such implementation is necessary to ensure the equitable and efficient allocation of limited water supplies during times of shortage.

Section V: Application

The provisions of the Plan shall apply to all persons utilizing water provided by the _______________ (name of irrigation district). The term "person" as used in the Plan includes individuals, corporations, partnerships, associations, and all other legal entities.

Section VI: Initiation of Water Allocation

The __________ (designated official) shall monitor water supply conditions on a __________ (e.g. weekly, monthly) basis and shall make recommendations to the Board regarding irrigation of water allocation. Upon approval of the Board, water allocation will become effective when _________________ (describe the criteria and the basis for the criteria):

Below are examples of the types of triggering criteria that might be used; singly or in combination, in an irrigation district's drought contingency plan:

Example 1: Water in storage in the ___________ (name of reservoir) is equal to or less than _____________ (acre-feet and/or percentage of storage capacity).

Example 2: Combined storage in the _________________ (name or reservoirs) reservoir system is equal to or less than _____________ (acre-feet and/or percentage of storage capacity).

Example 3: Flows as measured by the U.S. Geological Survey gage on the ______________ (name of reservoir) near _________________ ______________, Texas reaches ____ cubic feet per second (cfs).

Example 4: The storage balance in the district's irrigation water rights account reaches ______ acre-feet.

Example 5: The storage balance in the district's irrigation water rights account reaches an amount equivalent to _______ (number) irrigations for each flat rate acre in which all flat rate assessments are paid and current.

Example 6: The ____________ (name of entity supplying water to the irrigation district) notifies the district that water deliveries will be limited to ___________ acre-feet per year (i.e. a level below that required for unrestricted irrigation).

Section VII: Termination of Water Allocation

The district's water allocation policies will remain in effect until the conditions defined in Section IV of the Plan no longer exist and the Board deems that the need to allocate water no longer exists.

Section VIII: Notice

Notice of the initiation of water allocation will be given by notice posted on the District's public bulletin board and by mail to each ________ (e.g. landowner, holders of active irrigation accounts, etc.).

Section IX: Water Allocation

(a) In identifying **specific, quantified targets** for water allocation to be achieved during periods of water shortages and drought, each irrigation user shall be allocated _____ irrigations or ________ acre-feet of water each flat rate acre on which all taxes, fees, and charges have been paid. The water allotment in each irrigation account will be expressed in acre-feet of water.

Include explanation of water allocation procedure. For example, in the Lower Rio Grande Valley, an "irrigation" is typically considered to be equivalent to eight (8) inches of water per irrigation acre; consisting of six (6) inches of water per acre applied plus two (2) inches of water lost in transporting the water from the river to the land. Thus, three irrigations would be equal to 24 inches of water per acre or an allocation of 2.0 acre-feet of water measured at the diversion from the river.

(b) As additional water supplies become available to the District in an amount reasonably sufficient for allocation to the District's irrigation users, the additional water made available to the District will be equally distributed, on a pro rata basis, to those irrigation users having ________________.

Example 1: **An account balance of less than ______ irrigations for each flat rate acre (i.e. ____ acre-feet).**

Example 2: **An account balance of less than _____ acre-feet of water for each flat rate acre.**

Example 3: **An account balance of less than _ ___ acre-feet of water.** (c) The amount of water charged against a user's water allocation will be ____ (e.g. eight inches) per irrigation, or one allocation unit, unless water deliveries to the land are metered. Metered water deliveries will be charges based on actual measured use. In order to maintain parity in charging use against a water allocation between non-metered and metered deliveries, a loss factor of ____ percent of the water delivered in a metered situation will be added to the measured use and will be charged against the user's water allocation. Any metered use, with the loss factor applied, that is less than eight (8) inches per acre shall be credited back to the allocation unit and will be available to the user. It shall be a violation of the Rules and Regulations for a water user to use water in excess of the amount of water contained in the users irrigation account.

(d) Acreage in an irrigation account that has not been irrigated for any reason within the last two (2) consecutive years will be considered inactive and will not be allocated water. Any landowner whose land has not been irrigated within the last two (2) consecutive years, may, upon application to the District expressing intent to irrigate the land, receive future allocations. However, irrigation water allocated shall be applied only upon the acreage to which it was allocated and such water allotment cannot be transferred until there have been two consecutive years of use.

Section X: Transfers of Allotments

(a) A water allocation in an active irrigation account may be transferred within the boundaries of the District from one irrigation account to another. The transfer of water can only be made by the landowner's agent who is authorized in writing to act on behalf of the landowner in the transfer of all or part of the water allocation from the described land of the landowner covered by the irrigation account.

(b) A water allocation may not be transferred to land owned by a landowner outside the District boundaries.

or

A water allocation may be transferred to land outside the District's boundaries by paying the current water charge as if the water was actually delivered by the District to the land covered by an irrigation account. The amount of water allowed to be transferred shall be stated in terms of acre-feet and deducted from the landowner's current allocation balance in the irrigation account. Transfers of water outside the District shall not affect the allocation of water under Section VII of these Rules and Regulations.

(c) Water from outside the District may not be transferred by a landowner for use within the District.

or

Water from outside the District may be transferred by a landowner for use within the District. The District will divert and deliver the water on the same basis as District water is delivered, except that a ___ percent conveyance loss will be charged against the amount of water transferred for use in the District as the water is delivered.

Section XI: Penalties

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations, shall be considered in violation of Section 11.0083, Texas Water Code, *Vernon's Texas Codes Annotated*, which provides for punishment by fine of not less than $10.00 nor more than $200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties provided by the laws of the State and may by enforced by complaints filed in the appropriate court jurisdiction in ______ County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.

Section XII: Severability

It is hereby declared to be the intention of the Board of Directors of the ______________ (name of irrigation district) that the sections, paragraphs, sentences, clauses, and phrases of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the Board without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Section XIII: Authority

The foregoing rules and regulations are adopted pursuant to and in accordance with Sections 11.039, 11.083, 11.1272; Section 49.004; and Section 58.127-130 of the Texas Water Code, *Vernon's Texas Codes Annotated.*

Section XIV: Effective Date of Plan

The effective date of this Rule shall be five (5) days following the date of Publication hereof and ignorance of the Rules and Regulations is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

EXAMPLE RESOLUTION FOR ADOPTION OF A DROUGHT CONTINGENCY PLAN

RESOLUTION NO. __________

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE __________________ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the _____________ (name of water supplier) and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the Texas Water Code and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the __________________(name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE __________________ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as Exhibit A and made part hereof for all purposes be, and the same is hereby, adopted as the official policy of the _________________ (name of water supplier).

SECTION 2. That the ________________ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE ________________, ON THIS __ day of _______________, 20__.

____
President, Board of Directors

ATTESTED TO:

__________________________Secretary, Board of Director

Model Region K Drought Contingency Plan Template

Wholesale Water Providers

Model Drought Contingency Plan Template (**Wholesale Public Water Suppliers**)

DROUGHT CONTINGENCY PLAN
FOR THE
(Name of wholesale water supplier)
(address)
(CCN)
(PWS)
(Date)

Section I: Declaration of Policy, Purpose, and Intent

In order to conserve the available water supply and/or to protect the integrity of water supply facilities, with particular regard for domestic water use, sanitation, and fire protection, and to protect and preserve public health, welfare, and safety and minimize the adverse impacts of water supply shortage or other water supply emergency conditions, the ____________________ (name of your water supplier) adopts the following Drought Contingency Plan (the Plan).

Section II: Public Involvement

Opportunity for the public and wholesale water customers to provide input into the preparation of the Plan was provided by ______________ (name of your water supplier) by means of _______________ (describe methods used to inform the public and wholesale customers about the preparation of the plan and opportunities for input; for example, scheduling and proving public notice of a public meeting to accept input on the Plan).

Section III: Wholesale Water Customer Education

The _____________ (name of your water supplier) will periodically provide wholesale water customers with information about the Plan, including information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of ___________________ (e.g., describe methods to be used to provide customers with information about the Plan; for example, providing a copy of the Plan or periodically including information about the Plan with invoices for water sales).

Section IV: Coordination with the Lower Colorado Regional Water Planning Group

The service area of the _____________ (name of your water supplier) is located within the Lower Colorado Regional Water Planning Area and ___________ (name of your water supplier) has provided a copy of this Plan to the Lower Colorado Regional Water Planning Group.

Section V: Authorization

The ___________________ (designated official; for example, the general manager or executive director), or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _______________, or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section VI: Application

The provisions of this Plan shall apply to all customers utilizing water provided by the __________________ (name of your water supplier). The terms person and customer as used in the Plan include individuals, corporations, partnerships, associations, and all other legal entities.

Section VII: Criteria for Initiation and Termination of Drought Response Stages

The ____________ (designated official), or his/her designee, shall monitor water supply and/or demand conditions on a (e.g., weekly, monthly) basis and shall determine when conditions warrant initiation or termination of each stage of the Plan. Customer notification of the initiation or termination of drought response stages will be made by mail or telephone. The news media will also be informed.

The triggering criteria described below are based on:
____
____ (provide a brief description of the rationale for the triggering criteria; for example, triggering criteria are based on a statistical analysis of the vulnerability *of the water source under drought of record conditions).*

Stage 1 Triggers -- MILD Water Shortage Conditions

Requirements for initiation: The _____________ (name of your water supplier) will recognize that a mild water shortage condition exists when______________(*describe triggering criteria, see examples below).*

> ***Below are examples of the types of triggering criteria that might be used in a wholesale water supplier's drought contingency plan. One or a combination of such criteria may be defined for each drought response stage:***
>
> ***Example 1:*** ***Water in storage in the _________ (name of reservoir) is equal to or less than _______ (acre-feet and/or percentage of storage capacity).***

Example 2: ***When the combined storage in the __________ (name of reservoirs) is equal to or less than ______ (acre-feet and/or percentage of storage capacity).***

Example 3: ***Flows as measured by the U.S. Geological Survey gage on the ________ (name of river) near ________, Texas reaches ___ cubic feet per second (cfs).***

Example 4: ***When total daily water demand equals or exceeds ______ million gallons for ___consecutive days or ____ million gallons on a single day.***

Example 5: ***When total daily water demand equals or exceeds ___ percent of the safe operating capacity of ____________ million gallons per day for ___consecutive days or ___ percent on a single day.***

Requirements for termination: Stage 1 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. The _________ (name of water supplier) will notify its wholesale customers and the media of the termination of Stage 1 in the same manner as the notification of initiation of Stage 1 of the Plan.

Stage 2 Triggers -- MODERATE Water Shortage Conditions

Requirements for initiation: The _____________ (name of your water supplier) will recognize that a moderate water shortage condition exists when______________(describe triggering criteria).

Requirements for termination**:** Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. Upon termination of Stage 2, Stage 1 becomes operative. The _________ (name of your water supplier) will notify its wholesale customers and the media of the termination of Stage 2 in the same manner as the notification of initiation of Stage 1 of the Plan.

Stage 3 Triggers -- SEVERE Water Shortage Conditions

Requirements for initiation: The _____________ (name of your water supplier) will recognize that a severe water shortage condition exists when______________(*describe triggering criteria; see examples in Stage 1*).

Requirements for termination**:** Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. Upon termination of Stage 3, Stage 2 becomes operative. The _________ (name of your water supplier) will notify its wholesale customers and the media of the termination of Stage 2 in the same manner as the notification of initiation of Stage 3 of the Plan.

Stage 4 Triggers -- CRITICAL Water Shortage Conditions

Requirements for initiation - The _____________ (name of your water supplier) will recognize that an emergency water shortage condition exists when______________(*describe triggering criteria*; *see examples below*).

Example 1. ***Major water line breaks, or pump or system failures occur, which cause unprecedented loss of capability to provide water service; or***

Example 2. ***Natural or man-made contamination of the water supply source(s).***

Requirements for termination**:** Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased to exist for a period of ___ (e.g., 30) consecutive days. The _________ (name of your water supplier) will notify its wholesale customers and the media of the termination of Stage 4.

Section VIII: Drought Response Stages

The _________ (designated official), or his/her designee, shall monitor water supply and/or demand conditions and, in accordance with the triggering criteria set forth in Section VI, shall determine that mild, moderate, or severe water shortage conditions exist or that an emergency condition exists and shall implement the following actions:

Stage 1 Response -- MILD Water Shortage Conditions

Target: Achieve a voluntary __ percent reduction in __________ (e.g., total water use, daily water demand, etc.).

Best Management Practices for Supply Management:

Describe additional measures, if any, to be implemented directly by ____________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The ________________ (designated official), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate voluntary measures to reduce water use (e.g., implement Stage 1 of the customer's drought contingency plan).

(b) The _________________ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 2 Response -- MODERATE Water Shortage Conditions

<u>Target:</u> Achieve a ___ percent reduction in __________ (e.g., total water use, daily water demand, etc.).

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by ____________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The ________________ (designated official), or his/her designee(s), will initiate weekly contact with wholesale water customers to discuss water supply and/or demand conditions and the possibility of pro rata curtailment of water diversions and/or deliveries.

(b) The ________________ (designated official), or his/her designee(s), will request wholesale water customers to initiate mandatory measures to reduce non-essential water use (e.g., implement Stage 2 of the customer's drought contingency plan).

(c) The _________________ (designated official), or his/her designee(s), will initiate preparations for the implementation of pro rata curtailment of water diversions and/or deliveries by preparing a monthly water usage allocation baseline for each wholesale customer according to the procedures specified in Section VI of the Plan.

(d) The _________________ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 3 Response -- SEVERE Water Shortage Conditions

<u>Target:</u> **Achieve a ___ percent reduction in __________ (e.g., total water use, daily water demand, etc.)**.

<u>Best Management Practices for Supply Management</u>:

Describe additional measures, if any, to be implemented directly by ____________ (designated official), or his/her designee(s), to manage limited water supplies and/or reduce water demand. Examples include modifying reservoir operations procedures, interconnection with another water system, and use of reclaimed water for non-potable purposes.

Water Use Restrictions for Reducing Demand:

(a) The ________________ (designated official), or his/her designee(s), will contact wholesale water customers to discuss water supply and/or demand conditions and will request that wholesale water customers initiate additional mandatory measures to reduce non-essential water use (e.g., implement Stage 2 of the customer's drought contingency plan).

(b) The _________________ (designated official), or his/her designee(s), will initiate pro rata curtailment of water diversions and/or deliveries for each wholesale customer according to the procedures specified in Section VI of the Plan.

(c) The _________________ (designated official), or his/her designee(s), will provide a weekly report to news media with information regarding current water supply and/or demand conditions, projected water supply and demand conditions if drought conditions persist, and consumer information on water conservation measures and practices.

Stage 4 Response -- EMERGENCY Water Shortage Conditions

Whenever emergency water shortage conditions exist as defined in Section VII of the Plan, the _______________ (designated official) shall:

1. Assess the severity of the problem and identify the actions needed and time required to solve the problem.

2. Inform the utility director or other responsible official of each wholesale water customer by telephone or in person and suggest actions, as appropriate, to alleviate problems (e.g., notification of the public to reduce water use until service is restored).

3. If appropriate, notify city, county, and/or state emergency response officials for assistance.

4. Undertake necessary actions, including repairs and/or clean-up as needed.

5. Prepare a post-event assessment report on the incident and critique of emergency response procedures and actions.

Section IX: Pro Rata Water Allocation

In the event that the triggering criteria specified in Section VII of the Plan for Stage 3 Severe Water Shortage Conditions have been met, the ____________ (designated official) is hereby authorized initiate allocation of water supplies on a pro rata basis in accordance with Texas Water Code Section 11.039.

Section X: Enforcement

During any period when pro rata allocation of available water supplies is in effect, wholesale customers shall pay the following surcharges on excess water diversions and/or deliveries:

____ times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation up through 5 percent above the monthly allocation.

____ times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from 5 percent through 10 percent above the monthly allocation.

____ times the normal water charge per acre-foot for water diversions and/or deliveries in excess of the monthly allocation from 10 percent through 15 percent above the monthly allocation.

____ times the normal water charge per acre-foot for water diversions and/or deliveries more than 15 percent above the monthly allocation.

The above surcharges shall be cumulative.

Section XI: Variances

The ________________ (designated official), or his/her designee, may, in writing, grant a temporary variance to the pro rata water allocation policies provided by this Plan if it is determined that failure to grant such variance would cause an emergency condition adversely affecting the public health, welfare, or safety and if one or more of the following conditions are met:

(a) Compliance with this Plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the Plan is in effect.

(b) Alternative methods can be implemented which will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of this Plan shall file a petition for variance with the _________________ (designated official) within 5 days after pro rata allocation has been invoked. All petitions for variances shall be reviewed by the __________ (governing body), and shall include the following:

(a) Name and address of the petitioner(s).
(b) Detailed statement with supporting data and information as to how the pro rata allocation of water under the policies and procedures established in the Plan adversely affects the petitioner or what damage or harm will occur to the petitioner or others if petitioner complies with this Ordinance.
(c) Description of the relief requested.
(d) Period of time for which the variance is sought.
(e) Alternative measures the petitioner is taking or proposes to take to meet the intent of this Plan and the compliance date.
(f) Other pertinent information.

Variances granted by the ____________________ (governing body) shall be subject to the following conditions, unless waived or modified by the ____________ (governing body) or its designee:
(a) Variances granted shall include a timetable for compliance.
(b) Variances granted shall expire when the Plan is no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of this Plan occurring prior to the issuance of the variance.

Section XII: Severability

It is hereby declared to be the intention of the ________________ (governing body of your water supplier) that the sections, paragraphs, sentences, clauses, and phrases of this Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of this Plan, since the same would not have been enacted by the ____________________ (governing body of your water supplier) without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

EXAMPLE RESOLUTION FOR ADOPTION OF A

DROUGHT CONTINGENCY PLAN

RESOLUTION NO. __________

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE ____________________ (name of water supplier) ADOPTING A DROUGHT CONTINGENCY PLAN.

WHEREAS, the Board recognizes that the amount of water available to the _____________ (name of water supplier) and its water utility customers is limited and subject to depletion during periods of extended drought;

WHEREAS, the Board recognizes that natural limitations due to drought conditions and other acts of God cannot guarantee an uninterrupted water supply for all purposes;

WHEREAS, Section 11.1272 of the *Texas Water Code* and applicable rules of the Texas Commission on Environmental Quality require all public water supply systems in Texas to prepare a drought contingency plan; and

WHEREAS, as authorized under law, and in the best interests of the customers of the __________________(name of water supply system), the Board deems it expedient and necessary to establish certain rules and policies for the orderly and efficient management of limited water supplies during drought and other water supply emergencies;

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE __________________ (name of water supplier):

SECTION 1. That the Drought Contingency Plan attached hereto as "Exhibit A" and made

part hereof for all purposes be, and the same is hereby, adopted as the official policy of the _________________ (name of water supplier).

SECTION 2. That the ________________ (e.g., general manager) is hereby directed to implement, administer, and enforce the Drought Contingency Plan.

SECTION 3. That this resolution shall take effect immediately upon its passage.

DULY PASSED BY THE BOARD OF DIRECTORS OF THE ________________, ON THIS __ day of _______________, 20__.

____

President, Board of Directors

ATTESTED TO:

____
Secretary, Board of Directors

Model Region K Drought Contingency Plan Template

Steam-Electric Water Users

Model Drought Contingency Plan Template (Steam-Electric Uses)

DROUGHT CONTINGENCY PLAN
FOR
(Name of Facility)
(Address)
(Date)

Section I: Declaration of Policy, Purpose, and Intent

In cases of extreme drought, periods of abnormally high usage, system contamination, or extended reduction in ability to supply water due to equipment failure, temporary restrictions may be instituted to limit non-essential water usage. The purpose of this Drought Contingency Plan (the Plan), adopted by _____ (*name of your facility)* is to encourage a reduction of water use in order to maintain adequate supply to ensure the safe and reliable operation of _____ (*name of your facility),* and to protect the fresh water resources available.

Section II: Facility Staff Education

Management at _____ (*name of your facility*) will periodically provide the employees of the facility with information about the Plan, including the importance of the Plan, information about the conditions under which each stage of the Plan is to be initiated or terminated and the drought response measures to be implemented in each stage. This information will be provided by means of _____ (*example: describe methods to be used to provide employees with information about the Plan; for example, providing a copy of the Plan or holding staff meetings*).

Section III: Coordination with Regional Water Planning Groups

The water service area of the _____ (name of your facility) is located within the Lower Colorado Regional Water Planning Area (Region K) and the _____ (*name of your facility*) has provided a copy of the Plan to the Lower Colorado Regional Water Planning Group.

Section IV: Authorization

The _____ (*designated representative; for example, the plant manager*), or his/her designee, is hereby authorized and directed to implement the applicable provisions of this Plan upon determination that such implementation is necessary to protect public health, safety, and welfare. The _____ or his/her designee, shall have the authority to initiate or terminate drought or other water supply emergency response measures as described in this Plan.

Section V: Criteria for Initiation and Termination of Drought Response Stages

The _____ (*designated representative*), or his/her designee, shall monitor water supply and/or demand conditions and shall determine when conditions warrant initiation or termination of each stage of the Plan.

Stage 1 – Year-Round Water Conservation

Action: Implement the facility's Water Conservation Plan (example)

Reduction Target: None (operation under normal conditions); Include definition of year-round conservation in Water Conservation Plan. (examples)

Initiation: Ongoing

Termination: None

Water Use Reduction Response Measures (examples):

1. Irrigation of landscaped areas with hose-end sprinklers or in-ground irrigation systems is limited to no more than twice weekly. Water hours will be limited to between midnight and 10 a.m. and 7 p.m. and midnight.
2. ______(Other measures, as needed.)

Stage 2 -- MODERATE Water Shortage Conditions

Action: Curtail outdoor use of water for irrigation of landscape. (example)

Reduction Target: Achieve a _____ percent reduction in ______(e.g. percent of non-cooling water use)

Initiation: The _____ (*name of your facility*) will recognize that a moderate water shortage condition exists when _____ (*describe triggering criteria*).

Termination: Stage 2 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased. Upon termination of Stage 2, Stage 1, becomes operative.

Water Use Reduction Response Measures (examples):

1. Prohibit irrigation of landscape, except by hand-held hose, bucket, or drip irrigation.
2. Discontinue irrigation of lawns.
3. Discontinue washing and rinsing of vehicles and other equipment unless required for operation of the facility or to reduce hazards.
4. ______(Other measures, as needed.)

Stage 3 -- SEVERE Water Shortage Conditions

Action: Curtail consumptive water uses. (example)

Reduction Target: Achieve a _____ percent reduction in _____ (e.g. percent of consumed water)

Initiation: The _____ (*name of your facility*) will recognize that a severe water shortage condition exists when _____ (*describe triggering criteria*).

Termination: Stage 3 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased. Upon termination of Stage 3, Stage 2 or another appropriate Stage, becomes operative.

Water Use Reduction Response Measures (examples):

1. All water use for washing and rinsing of vehicles and other equipment will be stopped unless an alternative water source is used.
2. Reduce pumping from water source as directed by water supplier and/or based on ERCOT requirements.
3. ______ (Other measures, as needed.)

Stage 4 – CRITICAL/EMERGENCY Water Shortage Conditions

Action: Further curtail consumptive water uses. (example)

Reduction Target: Achieve a _____ percent reduction in _____ (e.g. percent of consumed water)

Initiation: The _____ (*name of your facility*) will recognize that a critical/emergency water shortage condition exists when _____ (*describe triggering criteria*).

Termination: Stage 4 of the Plan may be rescinded when all of the conditions listed as triggering events have ceased. Upon termination of Stage 4, Stage 3 or another appropriate Stage, becomes operative.

Water Use Reduction Response Measures (examples):

1. Reduce pumping from water source as directed by water supplier and/or based on ERCOT requirements.
2. ______ (Other measures, as needed.)

Section VI: Notification

Notification of the implementation of any mandatory provision of the Plan shall be made to _____ (e.g. water supplier; entity requiring the Plan)_______(method of notification) within______ (number of days) business days of implementation.

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APPENDICES

CHAPTER 8.0: ADDITIONAL RECOMMENDATIONS (INCLUDING UNIQUE ECOLOGICAL STREAM SEGMENTS AND RESERVOIR SITES, LEGISLATIVE ISSUES, AND REGIONAL POLICY ISSUES)

8.1 SUMMARY OF POLICY RECOMMENDATIONS

The approved scope-of-work for the development of the SB 1 water plan for the Lower Colorado Region included a subtask to "prepare possible legislative, regulatory, and administrative recommendations." In this regard, the Lower Colorado Regional Water Planning Group (LCRWPG) established a Legislation and Policy Committee and charged it with the responsibility for coordinating a three-step process to:

- Identify, define, and screen policy issues
- Evaluate issues and policy options
- Develop recommendations for consideration by the LCRWPG

The following recommendations are offered by the Lower Colorado Regional Water Planning Group (LCRWPG) for consideration by the Texas Legislature, TWDB, TCEQ, other water planning regions and all stakeholders and participants in Texas' regional and state water planning efforts. Each policy includes background information, policy statement(s), and action(s) the LCRWPG recommends.

The LCRWPG utilized a three-year long intensive policy development process in the first planning cycle, and a comprehensive review in each subsequent planning cycle to produce these results. Only policies that have met with the consensus approval of the LCRWPG's diverse voting membership are recommended by the LCRWPG. These policies have undergone a multi-level development process with extensive planning group review.

It is the hope of the many contributors to this process that these recommendations will lead to public policies and processes that improve upon the already impressive methods Texas uses to accomplish water planning.

8.1.1 Management of Surface Water Resources: Inter-Basin Transfers and Model Linking

8.1.1.1 Background Information

Proposed inter-basin transfers (IBTs) must be managed carefully relative to impairment of existing water rights, consistency with the public welfare including the need for water, consistency with state and regional water supply planning, and environmental and water quality issues.

For permits related to inter-basin transfers, among other considerations, the economic and public welfare interests in the basin of origin must be considered. If it is determined that unacceptable impacts would occur to these interests as a result of the IBT, special provisions to ensure protection of these interests would be warranted. Business, industry, agriculture and other economically important water users developed originally as a result of water availability. Without some means of protecting these users, water transfers should be carefully considered, including their potential impact on the economy of the entire region.

Some identified strategies for dealing with water supply shortages may impact sustainability of groundwater, when development of surface water supplies could be utilized instead. This approach could result in long-term adverse consequences for the region. Likewise, further development or transfer of surface water supplies could be detrimental to groundwater recharge and similarly result in long-term adverse consequences to the region.

8.1.1.2 Policy Statements

8.1.1.2.1. Inter-Basin Transfers

It is essential that current water supplies be protected and preserved to meet water commitments within the basin. Inter-basin transfers (IBTs) should follow principles established by LCRWPG in the first planning cycle, and revised in each subsequent planning cycle, for transporting water outside of the region.

In addition to the required elements for obtaining an IBT permit from TCEQ, the following nine-point policy identifies the conceptual elements and guidelines for transporting water outside of the Lower Colorado Regional Water Planning Area (LCRWPA):

1. A cooperative regional water solution shall benefit each region.
2. The LCRWPA's water shortages shall be substantially reduced.
3. Proposed actions for inter-regional water transfers shall have minimal detrimental water quality, environmental, social, economic, and cultural impacts.
4. Regional water plans with exports of significant water resources shall provide for the improvement of lake recreation and tourism in the LCRWPA over what would occur without water exports.
5. Each region shall determine its own water management strategies to meet internal water shortages when those strategies involve internal water supplies and/or water demand management.
6. Cooperative regional solutions shall include consideration of alternatives to resolve conflicts over groundwater availability and should be consistent with LCRWPG's groundwater policies and the applicable rules of involved groundwater conservation districts.
7. Any water export from the Colorado River shall not be guaranteed on a permanent basis.
8. Any water export from the Colorado River shall make maximum use of flood or excess inflows below Austin and shall occur only after in-basin demands are met in the LCRWPA. Provisions and supporting technical reviews included in a draft permit to support this principle shall be reviewed by the Regional Water Planning Group to assure consistency with the planning process.
9. Any water export from the Colorado River shall comply with the LCRA's inter-basin water transfer policy.

8.1.1.2.2. Linking Groundwater and Surface Water Models

Future groundwater and surface water modeling development by the state's water permitting and planning agencies should include the ability to link such models to better integrate the effects of changes in the uses or availability of either groundwater or surface water on each other in varying conditions such as flood or drought. The ongoing study by Texas Water Development Board is an investigation of surface water-groundwater interaction along the lower Colorado River and is part of efforts to provide additional information to the adaptive management phase of the Senate Bill 3 e-flows process. This pilot study is an excellent example of an important step in developing some of the additional science needed to develop such linkages. Such linking of models may be more appropriate for specific areas where groundwater and surface water closely relate and interact, such as concentrations of base-flow springs or stream-based recharge. The LCRWPG supports the development of methodologies to utilize available empirical data from public and private sectors to calibrate both groundwater and surface water models.

8.1.1.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to:

1. Support State funding for linking groundwater and surface water models by the TWDB during the development of the next generation of Groundwater Availability Models/Water Availability Models (GAMs/WAMs) with a priority for specific areas where groundwater and surface water closely relate and interact, such as concentrations of base-flow springs or stream-based recharge. Encourage the validation and calibration of models with data and technical reviews available from the public and private sectors.

Texas Commission on Environmental Quality (TCEQ) – The LCRWPG encourages TCEQ to:

1. Include provisions in water right permits related to inter-basin transfers that protect the basin of origin. Obtain concurrence that draft permits are consistent with the regional water planning process.
2. Provide the Regional Water Planning Groups with technical review summaries including WAM runs for pending permits affecting the region to ensure consistency with the regional planning process.

8.1.2 Environmental – Instream Flows and Freshwater Inflows to Bays and Estuaries

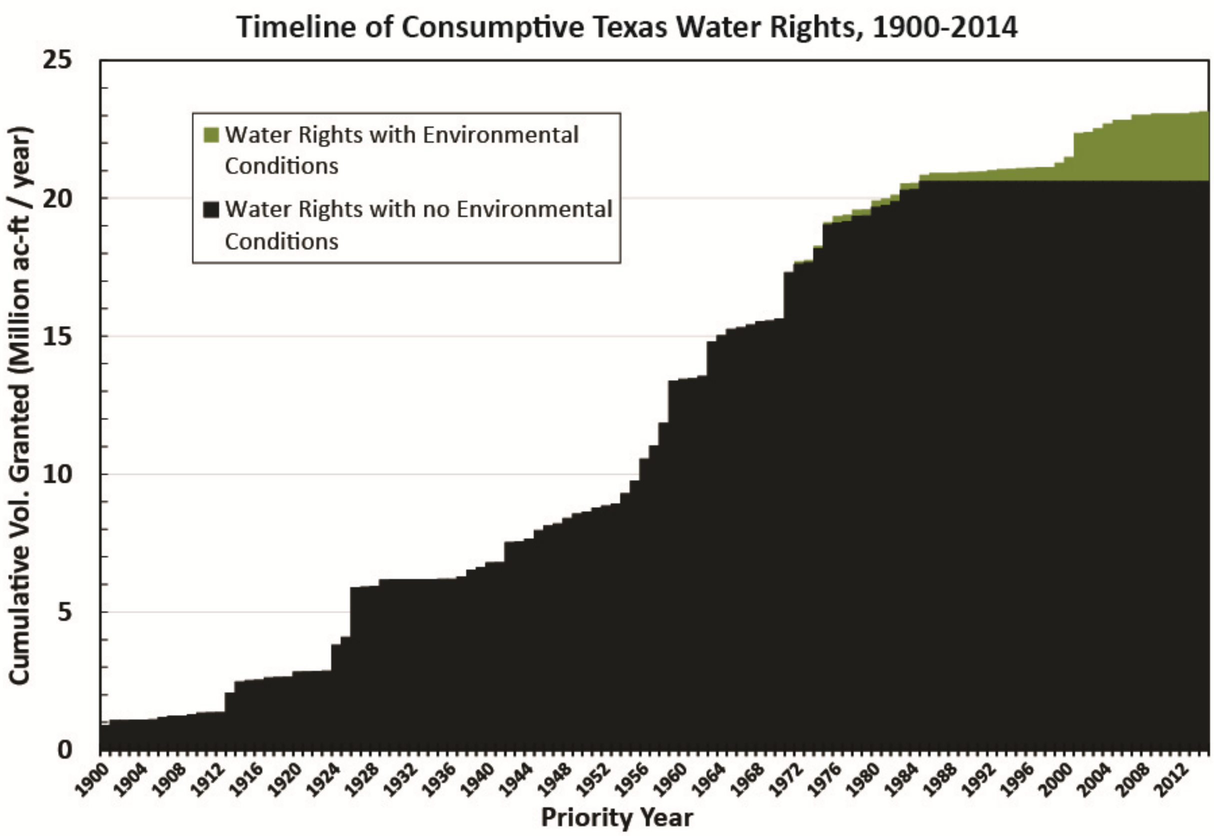
8.1.2.1 Background Information

Healthy and productive rivers, bays and coastal estuaries are the natural heritage of all Texans and support billions of dollars in economic activity annually. Texas' fish and wildlife resources need and deserve preservation and, in some cases, restoration.

Fortunately, a large percentage of surface water rights in Texas are currently not fully utilized, thereby resulting in, for the near-term, sufficient natural flows to provide for essential environmental needs during drought conditions. However, increasing utilization of existing water rights, as projected in the water plan, coupled with new water rights potentially threaten the availability of these essential environmental flows.

In the Colorado River Basin, modeling undertaken in development of the LCRA Water Management Plan predicts freshwater inflows not meeting the science-based targets with a repeat of historical precipitation patterns.

Total authorizations state-wide for consumptive use are approximately 22 million acre-feet of water per year and the vast majority of those authorizations were issued prior to 1985 without conditions to protect environmental flows. This creates a challenge that must be addressed in order to preserve Texas' fish and wildlife habitat.



Note: Hydropower, contracts, recreation and other non-consumptive water rights excluded. Rights before 1900 set to 1900.
Source: National Wildlife Federation analysis of data provided by the Texas Commission on Environmental Quality, May 2015.

8.1.2.2 Policy Statement

The LCRWPG supports the protection of instream flows and bay and estuary inflows at levels sufficient to protect native species throughout extended periods of drought at population levels that would enable the species to fully recover upon the return of normal weather conditions. During normal weather conditions, flows sufficient to ensure a healthy habitat for fish and wildlife should be assured. This requires addressing the specific water quality, flow rates and timing that are required to sustain a healthy and productive riparian and estuarine ecosystem as well as the physical form of the river such as deep pools, riffles, bluffs, terraces, and its vegetation, springs, and tributaries.

The LCRWPG recommends the following actions to accomplish environmental flow protection through the surface water permitting process by:

1. In areas where appropriating additional quantities of water could threaten the adequacy of environmental flows, permits for additional quantities of water should include environmental flow conditions consistent with the environmental flow standards adopted by TCEQ, including reasonable approaches for environmental flow protection to help achieve compliance with the flow standards, as well as strategy targets.

2. The environmental flow standards adopted by TCEQ are due for revision per statute. The state should ensure a prompt and robust revision process for environmental flow standards designed to produce science-based flow criteria with a goal of protecting a sound ecological environment.

3. In areas where predicted flows are not adequate to meet environmental flows standards, including strategy targets, adopted by TCEQ, the SB3 Basin and Bay Area Stakeholder Committees (BBASC) should identify strategies to ensure that the water needed to support a sound ecological environment for fish and wildlife is present in each river basin and bay system. In addition, the state should create a funding mechanism to assist with implementation of appropriate strategies to ensure environmental flows.

4. The state should aggressively seek the conversion of water rights to environmental uses through programs such as the voluntary sale or lease of water rights back to the state as a means of ensuring adequate flow conditions. These water rights should then be managed to provide for environmental flow protection.

5. Environmental flows should be considered as a use category in regional water planning. A State agency should change policy to address proactive measures to meet environmental demands where needed. A methodology for incorporating environmental flow needs into the RWP should be developed and recommended to the State legislature.

8.1.2.3 Actions Needed

Texas Legislature

- Provide funding for BBASC and Bay and Basin Area Expert Science Teams (BBEST) for a robust revision process for adopted environmental flow standards that produces science-based standards adequate to protect a sound ecological environment that include either the environmental flow set-asides called for by the 80th Texas Legislature through Senate Bill 3 or alternative approaches as identified by the BBASC.
- Appropriate funding to support further research and field studies dedicated to updated environmental flows standards and potential strategies to meet the standards.
- Appropriate funding to support the purchase and conversion of water rights to environmental uses through voluntary transactions.
- Further clarify the status of environmental flows as a use category as part of the regional water planning process.

Colorado and Lavaca Basin and Bay Area Stakeholder Committee

- Develop workplans to study and determine the most effective strategies to secure water to meet environmental flow needs.
- Continue studying the river/bay systems and update environment flow standards when necessary and as new research and information becomes available.
- Identify strategies to meet environmental flow needs.

8.1.2.4 Timing and/or Conflicts

The initial SB3 standards-adoption process has been completed for the Colorado and Lavaca Rivers and Matagorda/Lavaca Bays. As part of the SB3 adaptive-management process, the BBASC has developed a workplan, although the Environmental Flows Advisory Group has not acted to approve it, and, consistent with the workplan, is continuing its work to identify and review scientific studies to increase their understanding of the Colorado and Lavaca Rivers and Matagorda Bay systems. It is now time for the BBASC to develop recommendations for revisions of the adopted standards, but funding is not available to provide the BBASC with science-based input from the BBEST.

8.1.3 Environmental – Sustainable Growth, Including Impacts of Growth

8.1.3.1 Background Information

Sacrifices and trade-offs are often necessary to meet a greater common good, and this seems particularly true of water planning. With finite water resources available, sacrifices are likely inevitable. As always, water planning in Texas assumes certain demands can and should be met.

The state has not examined the issue of whether current planning efforts encourage the development of water supply strategies and trade-offs between various water users to support what may be a level of growth that is unsustainable. For example, if mining aquifers reduces viability of the region’s ecosystems, how should the state weigh these projected impacts against potential growth in water demand for cities and industries?

Business, industry, municipalities, agriculture and other economically important water users originally develop around water availability and its expected sustainability. Without some consideration of the impacts and provision of protections or adequate financial remuneration for these users, water transfers from one region to another may adversely affect the economy of the one region to benefit another area of the state.

8.1.3.2 Policy Statement

It is vital that the state assess sustainability of water-consuming growth patterns that regional water planning efforts potentially directly or indirectly support.

The LCRWPG recommends that efforts be made to understand and quantify the relationship between economic development and water supply sustainability. This effort, along with a willingness to have meaningful dialogue, could help lead to the creation of a responsible policy framework for truly sustainable water development and use in Texas.

The LCRWPG supports using education to address these concerns while the dialogue and policy development on sustainability takes shape. The LCRWPG strongly supports the proposed statewide Water IQ public education campaign and is encouraged that this campaign is focused on responsible use of this valuable natural resource.

8.1.3.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to provide for a comprehensive water sustainability study to address:

- Relationships between water planning and economic growth
- Long-term sustainability of water supplies
- Combined impacts to all water users of fully implementing all region-recommended water management strategies
- Impact on long-term food security, for Texas and national-markets, due to the conversion of water currently used for agriculture to other uses, and the depletion over time of agricultural water supplies
- Best practice methods used by other states or nations to encourage sustainable economic growth and water use conservation and efficiencies by all users.

The LCRWPG further encourages the Legislature to fully fund the Water IQ public education program, adjusting the curriculum to include education on sustainability as presented in the above policy statement.

8.1.3.4 Timing and/or Conflicts

This is for immediate action by the Texas Legislature.

8.1.4 Groundwater

8.1.4.1 Background Information

Groundwater resources vary greatly across the state and regions, both in quantity and quality. The difficulties and problems inherent in managing these diverse resources have been delegated to locally organized Groundwater Conservation Districts (GCDs) which have been designated by the Legislature as the preferred method of groundwater management in Texas. These local governmental entities are responsible for management, conservation, preservation, protection, and enhancement of groundwater resources in their individual jurisdictions. GCDs vary from small, one or two person offices in single county districts to larger agencies covering multiple counties and employing a staff of twenty or more.

GCDs have been an integral part of the regional planning process and have provided valuable input on local aquifer characteristics, usage, and availability. This input has resulted in a clearer picture of the importance of groundwater in the State’s future.

Groundwater is a major source of water in large portions of Texas. Planning efforts must ensure that this water supply will remain a long-term, viable option for consumption by local residents, agriculture, commercial, and other users. As most of the State’s surface water resources are fully subscribed and new reservoir projects are limited and controversial, many are looking to groundwater projects to fill the need where demands exceed or are expected to exceed supplies. These areas are increasingly looking to strategies such as brackish groundwater desalination, aquifer storage and recovery, and importation of groundwater from less populated areas.

Each of the strategies have questions to be addressed and are not without controversy which underscores the need for more inclusive and coordinated planning efforts on the State, regional, and local levels in order to avoid long-term adverse consequences at either end of the supply line.

In HB 1763 (2005) the Legislature set forth a vehicle for accomplishing aquifer-wide management of the resource through Groundwater Management Area (GMA) adoption of Desired Future Conditions (DFCs) for each aquifer or portion of an aquifer underlying the GMA and are provided to the TWDB every five years. The TWDB uses the DFCs to provide the GCDs within the GMA with the Modeled Available Groundwater (MAG) for each relevant aquifer underlying the GMA. Regional water planning groups are obligated to use the calculated MAG volumes derived from the DFCs for the relevant aquifers as the amount of groundwater available for regional planning purposes. Other non-relevant aquifers do not require DFCs and therefore, available supply volumes for planning purposes will likely be determined by the planning groups using information provided by the GCDs.

The groundwater planning process under HB 1763 was substantially modified by SB 660 in 2011 to generally involve more public participation opportunity and a more rigorous consideration of DFCs. The new planning requirements, which are borne by the GCDs, are unfunded and may prove to be a difficult responsibility for GCDs, many of which have limited resources, to fulfill in a manner that is beneficial to the overall State water planning process. This concern coupled with the increased level of importance placed on the water availability estimates for determining eligibility for SWIFT funding may warrant special consideration.

The LCRWPG has reviewed a variety of groundwater policy issues. Some have been incorporated into other sections of this policy document. Ten issues and corresponding policy statements are discussed below.

8.1.4.2 Policy Statements

8.1.4.2.1. The Rule of Capture

Texas groundwater law is based on the Rule of Capture. The Rule of Capture is a tort rule of non-liability established in 1904 that allows the owner of the overlying property to pump or capture any amount of groundwater provided that it is not wasteful, malicious or does not cause subsidence. GCDs may modify the Rule of Capture by means of rule-making authority described in Texas Water Code Chapter 36. The LCRWPG's policy is to continue its support of GCDs and their ability to modify the Rule of Capture when and where appropriate.

8.1.4.2.2. Groundwater Ownership

The debate over groundwater ownership in Texas has been provided with some clarity from both the Legislature through the passing of SB 332 in 2011 and the Texas Supreme Court with the opinion issued in the *Edwards Aquifer Authority v. Day* case in 2012. In short, SB 332 recognized that a landowner has a property interest in groundwater in place subject to reasonable regulation by a GCD but also concluded that "unreasonable" regulation by a GCD may constitute a compensable taking of that property for public use. Similarly, the *Day* case affirmed the authority of the Edwards Aquifer Authority to limit pumping but also found that land ownership includes an interest in groundwater in place. The two events together validate the role of GCDs to manage groundwater but confirm that the landowner is entitled to compensation when regulation constitutes a taking of the property. These findings, however, provide little guidance on when such regulation becomes a taking or how to determine the amount of compensation when a taking has occurred.

The LCRWPG recognizes the importance of managing the groundwater resources of the State and it is the LCRWPG's policy to support GCDs as the preferred method of groundwater management and their long-term financial and institutional stability to serve their statutory purpose.

8.1.4.2.3. Groundwater Management by GCDs

The LCRWPG supports local management of groundwater by GCDs as well as aquifer-wide planning and coordination between GCDs within GMAs. GCDs have been managing and regulating groundwater since the early 1950's and should be maintained as the State's preferred method of groundwater management and regulation.

The LCRWPG supports the establishment of GCDs by the most effective mechanism and configuration considering what is determined to be the option that is most reasonable, practical, effective, efficient and achievable. To this end, consideration should be given to the possibility of annexation of new areas into existing GCDs or consolidation of existing GCDs in an effort to optimize and enable more effective and efficient groundwater management provided that it is feasible and locally supported. New GCDs should continue to be delineated, established, and confirmed by local confirmation elections. The LCRWPG recognizes that GCDs are local governments that are confirmed by local elections, and it is the LCRWPG's policy that any such attempts to annex, consolidate existing GCDs, or other reorganization of GCDs must be referred to the local election process for validation or rejection.

8.1.4.2.4. DFCs and MAGs

The LCRWPG supports GMA-wide cooperation in management of groundwater resources including joint efforts among GCDs with shared relevant aquifers to establish and implement compatible rules and management plans to preserve the GMA-adopted DFCs. DFCs of adjacent GMAs for a shared aquifer should be compatible. While the DFC is the appropriate metric and management goal, the MAG should be given appropriate consideration as a management tool when establishing rules and making permitting decisions. Permitting decisions informed by the MAG and other relevant considerations should be followed by continuous and long-term aquifer monitoring of the actual aquifer conditions to ensure preservation of the DFC. The LCRWPG recommends that GCDs commit to long-term aquifer monitoring programs and data collection to refine the models and other analytical tools such that long-term effects of pumping can be more accurately predicted and factored into groundwater management decisions. Where DFCs are compromised as measured by actual aquifer conditions, the LCRWPG supports the use of mitigation plans or authority by GCDs to adjust permits as necessary.

The GMA planning process provides an opportunity to unify the legal and institutional disconnect between surface and groundwater management if DFCs are established where appropriate to refer to a surface water condition that is affected by groundwater pumping and management. The LCRWPG's policy encourages GMAs to establish such surface water-related DFCs (e.g. minimum springflows, baseflows, reservoir inflows, etc.) where appropriate.

8.1.4.2.5. Sustainability

The LCRWPG supports a sustainable approach to groundwater management in areas where such an approach is reasonably achievable. Sustainability is defined as balancing groundwater withdrawals with natural recharge and replenishment to maintain long-term stability in regional or local groundwater supplies. It is the LCRWPG's policy to look to GCDs within a given GMA to cooperate in determining the degree to which sustainability can be achieved.

8.1.4.2.6. Groundwater Marketing (e.g. Water Rights Leases, Sales, Transfers)

The LCRWPG's policy is to establish coordination between water marketing proposals with local GCDs and RWPGs and support the requirement that state agencies and private interests comply with all local GCD rules, state-certified groundwater management plans, and state and regional water plans.

8.1.4.2.7. Improving Groundwater Availability Data

The LCRWPG's policy is to encourage new funding sources for GCDs specific to data collection and storage methods that emphasize ease of public accessibility. The LCRWPG's policy is to support the funding needs of the TWDB for the maintenance and expansion of state-wide groundwater databases.

8.1.4.2.8. Funding and Technical Assistance for GMA Planning

The expanded process and additional complexity added to the GCD's joint-regional groundwater planning responsibilities through SB 660 in 2011 is influencing the planning area GMA's determination of certain aquifers as "non-relevant for regional planning purposes" in order to avoid extensive and costly reporting and public vetting processes. Further, the relevant aquifers with DFCs that are being proposed or continued will require GCD funds and resources to complete the more rigorous process that might otherwise be used to further develop the GAMs and planning tools. It is the LCRWPG's policy to encourage the TWDB to provide funding to facilitate GMA's role in determining groundwater availability estimates for Regional planning. Additionally, the LCRWPG supports funding for the TWDB to provide the technical assistance to the GMAs as required by SB 660.

8.1.4.2.9. MAG Peak Factors

MAG values were developed using groundwater availability models calibrated for long-term average, not drought of record, conditions. TWDB revised its planning rules to include a MAG Peak Factor that ensures regional water plans have the ability to fully reflect how GCDs anticipate managing groundwater production under drought conditions. The LCRWPG supports the limited use of the MAG Peak Factor when: 1) it is allowable under the policies of the local groundwater conservation district; 2) the relevant groundwater conservation district provides written consent to use the MAG Peak Factor; 3) TWDB Executive Administrator approves each MAG Peak Factor; 4) a technical basis for the use of MAG Peak Factor is provided; and, 5) the MAG Peak Factor will not prevent the groundwater district from managing groundwater resources to achieve the desired future conditions. The supported goal in this case would be to meet a temporary need through intermittent pumping of the aquifer with volumes greater than the MAG during drought that is offset by pumping in wetter (more typical) years that is expected to fall below the MAG. The LCRWPG does not support utilizing the MAG Peak Factor when such use could be expected to contribute to subsidence.

8.1.4.2.10. Utilization and Permitting of Brackish Water

The LCRWPG recognizes the value brackish water might have as a resource to meet the growing water needs in Texas and supports legislative actions that advance accessing this resource. The LCRWPG further believes that local groundwater conservation districts are the most logical and appropriate governmental body to regulate and permit wells targeting brackish water zones. Potential brackish water zones may be beyond the normal 'window' where computer modeling runs are performed to determine water availability. Additionally, recent legislation has mandated a 30-year duration for brackish water permits. Long-term and ongoing monitoring will be necessary to track potential impacts on water levels and water quality in the same or adjacent aquifers and for the potential effects of subsidence. In order to more efficiently accommodate the necessary studies and long-term monitoring, the bulk of the costs should be borne primarily by the applicant or by the TWDB.

8.1.4.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Texas Legislature to:

1. Sufficiently fund TWDB programs specifically related to GMA planning, groundwater conservation, protection, enhancement, groundwater availability modeling (including development/ review/ updating/ recalibration), technical assistance to GCDs and GMAs, and database management and accessibility. Specifically, funding should be provided to the TWDB to be allocated for GMAs for regional water planning in a manner similar to funding available to Regional Water Planning Groups; and
2. Confirm that the State has joint liability with GCDs when GCD decisions that are made to satisfy statutory groundwater management obligations are judged to be compensable takings. Such joint liability would require that the State contribute financially to the just compensation for the taking.

Texas Water Development Board – The LCRWPG encourages TWDB to:

1. Seek adequate funding for GMA planning, groundwater related programs, GAM needs, and technical assistance to GCDs and GMAs;
2. Continue assisting GCDs in their management planning, groundwater quantity and quality research, water conservation programs, and inter-agency cooperative database management efforts (such as the Texas Water Information Network); and

Groundwater Conservation Districts – The LCRWPG encourages GCDs to:

1. Work cooperatively with GMA and regional planning efforts; and
2. Continue to expand or develop groundwater research and database efforts in order to be the primary resource for groundwater data in their jurisdiction.

8.1.4.4 Timing and/or Conflicts

The 87th Session of the Texas Legislature will occur in 2021 and will be setting the budget for the following biennium which will have direct impacts on funding programs needed by the TWDB, GCDs, and RWPGs.

Groundwater planning through the GMA process has further developed into a process that assigns the responsibility for determining groundwater availability for planning purposes to GCDs. The importance of this role should be recognized through the implementation of the recommended actions in the 87th legislative session.

8.1.5 Potential Impacts to Agricultural and Rural Water Supplies

8.1.5.1 Background Information

Some water supply strategies feature transfers of water from rural to urban areas to meet projected urban growth in Texas. These strategies may not adequately assess the potential for harm to rural economies and rural culture. As former Texas Agriculture Commissioner Susan Combs once said, "We can't afford to dewater or leave behind rural Texas."

While compensation to select individuals may occur to facilitate water transfers from one region to another, the economic impacts of the transfer from one region may extend well beyond the individuals who are compensated and may result in negative impacts to others. In other cases, irrigators are often purchasers of water from water rights owners who may sell the water for other uses, thus limiting access to water for irrigated agriculture.

As previously stated, water transfers and water marketing must be carefully considered, and potentially utilized to help fund water conservation and efficiency projects.

In general, much of agriculture and rural Texas cannot afford water at the prices that some cities and industry will pay. Water pricing should be examined for its impact on the availability of water to meet projected needs for agriculture and rural Texas.

8.1.5.2 Policy Statement

The state should be careful that transfers of surface water or groundwater occur only after sufficient study and consideration of local supplies and economies that could be adversely affected, including mitigation opportunities and funding mechanisms.

8.1.5.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to:

1. Strengthen GCDs' abilities to reasonably protect and preserve groundwater supplies for both present and future local uses.
2. Maintain water policies that protect basins of origin in interbasin transfers of surface water.
3. Require that TCEQ provide notice to regional water planning groups of pending water supply actions.
4. Support funding for rural community infrastructure and water supply planning for regional planning, emergency water connections and redundant drinking supplies.

Texas Commission on Environmental Quality – The LCRWPG encourages TCEQ to provide pertinent technical reviews and draft surface water permits to affected regional water planning groups to confirm consistency with regional water plans.

8.1.5.4 Timing and/or Conflicts

These recommendations should be implemented during the next legislative session.

8.1.6 Agricultural Water Conservation

8.1.6.1 Background Information

With finite water resources available to a growing Texas populace, it is necessary that all possible means of stretching those finite resources be explored and implemented. Agriculture, being the single largest water user group, represents the area where conservation may offer the most hope for freeing up substantial water supplies.

The profit margins of irrigated agriculture may not allow producers to invest in major water conservation measures without participation by others. The Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture administers a number of conservation programs that could be utilized and further optimized to enhance the likelihood of irrigators implementing water conserving practices.

The NRCS Environmental Quality Incentives Program (EQIP) is the NRCS' most likely platform for encouraging agricultural water conservation. Water quantity is a national and state priority of EQIP. EQIP funding is continually subject to Congressional appropriations that determine the program's viability on an annual basis.

An opportunity exists for the development of public/private partnerships for the purpose of enhancing the sustainability of agricultural and environmental water supplies in ways that market forces may not otherwise provide. Using available marketing techniques, responsible corporate conservation sponsors can gain positive recognition for helping to accomplish meaningful agricultural conservation while supporting healthy riverine and estuarine habitats.

8.1.6.2 Policy Statement

The LCRWPG encourages agricultural water conservation as a method of stretching existing supplies by reducing agricultural demands in order to increase water availability to meet new and existing water demands. The LCRWPG further recognizes the need for public and private partnerships with irrigators to fund experimental, existing, and proven water conservation technology.

8.1.6.3 Actions Needed

United States Congress – The LCRWPG encourages that Congress sufficiently fund NRCS programs aimed at implementing known water conservation technology and at developing promising, new technology for water conservation.

Texas Water Development Board – The LCRWPG encourages TWDB to aid the NRCS State Conservationist in targeting water conservation program funding to projects that offer the most water conservation benefit for the state. The TWDB should also offer expert testimony to the Agriculture Committees of both the Senate and the House regarding the need and effectiveness of water conservation accomplished through EQIP in order to highlight the ongoing need for adequate NRCS EQIP funding. The LCRWPG further encourages TWDB to provide leadership in encouraging corporate sponsorship of agricultural water conservation initiatives.

Joint TCEQ, TWDB and Legislature – Develop water use metrics and efficiency standards and best management practices, including monitoring and delivery systems basin-wide.

Regional Planning Groups – The LCRWPG encourages all planning groups to adopt water plans that capitalize on the potential for partnering between water user groups to accomplish much needed water conservation in ways that share both the burdens and the benefits between water user groups.

8.1.6.4 Timing and/or Conflicts

Creative funding and implementation of water conservation is an ongoing responsibility for all water user groups and their constituents.

8.1.7 Municipal/Industrial Conservation

8.1.7.1 Consistent GPCD Methodology

8.1.7.1.1. Background Information

In its December 2008 report to the 81st Texas Legislature, the Texas Water Conservation Advisory Council (TWCAC) cautioned:

"The tendency of the media or individuals to use gallons per capita per day (GPCD) as a way to compare conservation efforts of communities is also problematic when the metric is not uniformly defined. Therefore, the Council has determined that it should be a priority to develop standard methodologies for water use metrics and water conservation metrics and definitions."

While various GPCD calculations, such as total daily average GPCD, can be a good measure for internal year-to-year comparisons within one water system, inconsistencies still exist in determining GPCD.

SB 181 was passed by the Legislature in 2011 to develop a consistent methodology for calculating GPCD. The TWDB and the TCEQ, with the assistance of the TWCAC, finalized the document, "Guidance and Methodology for Reporting on Water Conservation and Water Use," in December of 2012. It can be found on the TWDB and TCEQ web sites. While this document outlines a standard methodology for calculating GPCD, there are still inconsistencies in determining GPCD that could be further standardized to facilitate consistent and comparable GPCD.

8.1.7.1.2. Policy Statement

The LCRWPG supports the use of methodologies outlined in the December 2012 "Guidance and Methodology for Reporting on Water Conservation and Water Use" report, efforts to further standardize and facilitate GPCD calculations, and the study of other metrics to assess water use efficiency.

8.1.7.1.3. Actions Needed

Texas Legislature and TWDB – The LCRWPG encourages the continued support for efforts by the TWCAC to develop consistent methodology for calculating commercial, industrial, and institutional measurements that can successfully track water use and water savings over time for these water use sectors.

8.1.7.2 Consistent Water Savings Metrics

8.1.7.2.1. Background Information

The TWDB Report 362, Water Conservation Best Management Practices (BMP) Guide, revised May 2019, evaluated and recommended water use efficiency measures and provided guidance on how to determine water savings. Measures ranged from toilet and washing machine incentives to water loss reduction programs. Additional conservation strategies such as irrigation standard requirements, mandatory watering schedules, soil depth requirements, irrigation efficiency upgrades and other strategies have not been studied extensively to evaluate effective water savings. Many of the BMPs found in the 2004 report have been updated by TWCAC. These BMPs can be found at the Council's website www.savetexaswater.org. However, most of these measures do not include water savings estimates or metrics.

8.1.7.2.2. Policy Statement

The LCRWPG supports the development of consistent metrics to assess the amount of water saved per conservation measure or technique in order to track the success of conservation strategies. Recent efforts with tracking and measuring savings from academic institutions such as Texas A&M AgriLife Research and the Pecan Street public/private partnership should be supported by the State and local water entities.

8.1.7.2.3. Actions Needed

Texas Legislature and TWDB – The LCRWPG encourages the funding of research efforts to determine water savings and incorporate the information into current and future BMPs found on the Council website. This information should be aimed at providing water suppliers with useful information for developing and implementing conservation goals and successful management strategies.

8.1.7.3 Additional Financial Assistance to Reduce Water Loss

8.1.7.3.1. Background Information

In 2003, the 78th Texas Legislature enacted House Bill 3338 which requires all retail water suppliers to submit water loss audits to the TWDB. TWDB collected water loss audits for the years of 2005 and 2010 with response rates that were slightly more than 50 percent. However, that response rate percentage represents at least 75 percent of the water volume usage in Texas.

Since HB 3338 was enacted, the 82nd Texas Legislature (2011) passed House Bill 3090 which requires annual water loss audits from all retail public utilities receiving financial assistance from TWDB. The first of these annual reports were due May 1, 2013. The 83rd Texas Legislature enacted House Bill 857 (2013) which requires each retail public water utility with more than 3,300 connections to conduct a water audit annually to determine its water loss and to submit that audit to TWDB. The initial annual water audits were due May 1, 2014. A retail public water utility with 3,300 or less connections will continue to be required to conduct and submit a water audit once every five years computing the utility's system water loss during the preceding year.

Based on these audit reporting requirements, a historical record of water loss in the State is readily available on the TWDB web site. For the years 2010, 2014, and 2017, the average water loss in the State (both real and apparent) was 19.5%, 20.6%, 19.5%, respectively. For Region K, the 2010, 2014, and 2017, the average water loss was 17.1%, 18.4%, 20.6%, respectively, indicating an upward trend in water loss from 2010 to 2017.

The 83rd Texas Legislature also enacted House Bill 3605 (2013) that requires a retail public water utility that receives financial assistance from the Board to use a portion of that assistance—or any additional assistance provided by the Board—to mitigate the utility's system water loss if based on its water audit the water loss meets or exceeds a threshold to be established by Board rule.

8.1.7.3.2. Policy Statement

The LCRWPG recognizes that funding is now available through the SWIFT fund as well as the TWDB fund for loans for retail utility water loss projects.

8.1.7.3.3. Actions Needed

Texas Legislature and TWDB - should market the SWIFT funding for utility water loss projects. The funds would be used to replace aging or deteriorated pipe, to replace inaccurate or incorrectly sized water meters, to enhance leak detection efforts, or to implement a pressure reduction strategy if warranted.

8.1.7.4 Conservation Coordinators

8.1.7.4.1. Background Information

With the current state water plan depending so heavily on conservation to meet future water needs, it is essential that water conservation plans result in quantifiable savings. To that end, requiring a designated water conservation coordinator would increase accountability for the implementation of water conservation measures and the tracking of water savings.

8.1.7.4.2. Policy Statement

The LCRWPG supports the designation of a conservation coordinator by all public water suppliers with the responsibility for the implementation and monitoring of the conservation plan, tracking and reporting water savings to the State, and recommending further improvements to the plan. Responsibility could be assigned to a newly created position for this purpose, an existing position or employee of the water provider, or a shared water conservation coordinator contracted through several small water providers.

8.1.7.4.3. Actions Needed

TCEQ - The LCRWPG encourages the TCEQ to amend Title 30, Texas Administrative Code (TAC) Chapter 288, so that all public water suppliers required to have a conservation plan are also required to have a designated water conservation coordinator with the duties before mentioned.

8.1.7.5 Dedicated Conservation Funding

8.1.7.5.1. Background Information

Water conservation programs offered by water providers are typically funded on an annual basis from revenues received from water use. Unfortunately, the funding can vary yearly because water use is impacted by uncertain factors such as weather. Some providers have historically cut program funding during non-drought years, assuming that conservation is only needed for droughts. However, if conservation is to stretch existing water supply resources to meet future water demand, a reliable fund must be available to sustain and grow conservation programs.

Having a dedicated conservation fund would help water providers plan for multi-year conservation programs and pursue research opportunities to help further water conservation efforts. Dedicated financial support for conservation could be achieved by assessing a meter or account conservation fee, or through a set-aside of a certain percentage of the annual revenues, as seen with a number of water providers throughout Texas.

8.1.7.5.2. Policy Statement

The LCRWPG supports water providers having the ability to set up a dedicated funding stream for water conservation programs and projects.

8.1.7.5.3. Actions Needed

Encourage the State to adopt legislation that would allow water providers to set up a dedicated funding stream for water conservation.

8.1.8 Reuse (including basin-specific assessment of reuse potential and impacts)

8.1.8.1 Background Information

Water reuse typically can be divided into two types, direct and indirect. Direct reuse is when reclaimed water or treated effluent is pumped directly from a wastewater treatment plant to a place of use. Direct reuse for non-potable purposes is typically delivered through a "purple pipe" distribution system. Another type of reuse is the direct reuse of treated effluent for potable purposes or Direct Potable Reuse (DPR.) Through DPR treated effluent is piped directly to a water treatment plant for further treatment of potable standard, without the benefit of attenuation and retention time offered by an environmental buffer like a river or reservoir. DPR may be viable where other supplies are scarce, such as in drought conditions, or in other applications, provided that there are sufficient barriers in place to ensure that the output is of appropriate quality to minimize and mitigate for environmental impacts or risk to human health and safety. The TCEQ administers water quality requirements for direct reuse through its Chapter 210 rules. Indirect reuse is a method by which discharged effluent is conveyed to a point of use via the bed and banks of a watercourse.

Under most surface water rights, the full amount of water may be used and reused for the purposes and location of use provided for in the underlying water right without additional authorization. However, once this water is discharged to a stream, it becomes waters of the State, available for use by others. Specific authorization for indirect reuse must be obtained to convey discharged effluent for reuse at a downstream point of use.

In addition to the traditional protections against carriage losses, indirect reuse authorizations are subject to special conditions to protect downstream water rights that may have been granted in reliance on the flows remaining in the watercourse or to protect the environment.

Water reuse is an important water management strategy. TCEQ is the State's agency charged with regulatory processes related to this issue.

8.1.8.2 Policy Statement

LCRWPG supports reuse as a water management strategy, in accordance with State Law and SB 1. The Group recognizes that there are potentially complex issues associated with reuse. Therefore, LCRWPG will continue to examine reuse as a water management strategy in an effort to better understand potential long-term impacts. LCRWPG will continue to monitor legislative developments regarding reuse and will incorporate those developments into its deliberations and planning.

8.1.8.3 Actions Needed

Texas Commission on Environmental Quality – LCRWPG encourages TCEQ to continue its thorough review and approval processes for indirect reuse applications. It is through this application process that potential impacts, including environmental and water rights impacts, should be addressed.

The LCRWPG encourages TCEQ to develop standards and best management practices for Direct Potable Reuse projects to minimize and mitigate for any risk to the environment and human health and safety.

8.1.8.4 Timing and/or Conflicts

Consideration of reuse should be an integral part of the ongoing regional water planning process.

8.1.9 Brush Management

8.1.9.1 Background Information

Brush control has been widely recognized as an effective means of increasing water availability through the thinning or elimination of certain brush species that would otherwise uptake and transpire significant amounts of water. Brush control has the potential to conserve water lost to evapotranspiration, increase recharge to groundwater and aquifers, enhance spring and stream flows, restore native wildlife habitat by improving rangeland, improve livestock grazing distribution, aid in wildfire suppression by reducing hazardous fuels, and manage invasive species.

In recognition of these facts the Texas Legislature initiated the Texas Brush Control Program in 1985. The Program developed its first State Brush Control Plan in 1987. According to the 1987 Plan there were approximately 105 million acres of rangeland infested by brush, 32 million of which were considered dense.

The Plan points out that pre-settlement Texas offered broad expanses of open prairie grasslands with only modest tree and brush growth along water courses and rocky hills. Settlement brought fire control, fencing and intensive grazing practices that resulted in conditions that enabled the proliferation of brushy species suited to the barer, drier landscape that ensued.

In 2011 the 82nd Texas Legislature created the Water Supply Enhancement Program (WSEP) to replace the Texas Brush Control Program while furthering its objectives. The purpose of the WSEP was to increase available surface and ground water supplies through the selective control of brush species that are detrimental to water conservation. The WSEP was administered by the Texas State Soil and Water Conservation Board (TSSWCB) until August 31, 2019, at which point the funding for the program was not restored by the Legislature. In July 2014, the TSSWCB adopted its first State Water Supply Enhancement Plan. The TSSWCB collaborates with a range of agencies to identify watersheds across the state where it is feasible to implement brush control in order to enhance public water supplies. A brush control feasibility study was published in 2000 by the LCRA for the Pedernales River above Lake Travis (*Pedernales River Watershed Brush Control Assessment and Feasibility Study*, Lower Colorado River Authority, 2000). The TSSWCB uses a competitive grant process to allocate WSEP cost-share funds, giving priority to projects that balance the most critical water conservation need of municipal water user groups with the highest projected water yield from brush control. The TSSWCB then works through local soil and water conservation districts to develop 10-year resource management plans on properties enrolled in the WSEP in order to assist landowners in implementing brush control activities. Cost-share assistance is provided through the WSEP to landowners implementing their resource management plans.

According to the 2017 WSEP Annual Report, under this State Water Supply Enhancement Plan, during fiscal year 2017, 30,202 acres of brush control were incentivized across the state and are proposed to result in the conservation of 9,364 ac-ft of water at a cost of about $132.70 per ac-ft of water. In the Pedernales River watershed, since the Program started through fiscal year 2017, over 74,718 acres of brush have been treated by landowners.

8.1.9.2 Policy Statement

The LCRWPG supports brush control as an effective means of enhancing water supplies and encourages that all feasible means be utilized to maximize and target brush control efforts in watersheds that are experiencing below normal inflows to water supplies and which offer the greatest opportunity for helping to meet identified water supply shortages.

8.1.9.3 Actions Needed

1. The LCRWPG encourages the Texas State Soil and Water Conservation Board (TSSWCB) to request Water Supply Enhancement Plan (WSEP) brush control cost-share funding in an amount sufficient to accomplish the greatest water supply enhancement for areas that are experiencing the greatest percentage reduction from average of their water supply reservoir storage levels. The LCRWPG recognizes that the WSEP governing statute and agency rules currently limit the program to the Pedernales River watershed.
2. The LCRWPG encourages the Texas Legislature to reinstate and fund the WSEP sufficiently to accomplish significant water supply enhancement throughout the areas most negatively impacted by the invasion of brushy plants and more specifically those areas experiencing significant reduction from average of their water supply reservoir storage levels. Based on the economic

analysis included in the published brush control feasibility study, just for the Pedernales River watershed, $23.6 million is needed to fully implement brush control on all acres identified for treatment (*Pedernales River Watershed Brush Control Assessment and Feasibility Study*, Lower Colorado River Authority, 2000).

3. The LCRWPG encourages the TSSWCB to conduct brush control feasibility studies for the Lake Buchanan, Lake LBJ watersheds, and other watersheds in the region in order to estimate the potential water yield from brush control. Based on current WSEP governing statute and agency rules, completed feasibility studies for these watersheds would "open up" eligibility for WSEP cost-share funds to landowners in these watersheds.

8.1.9.4 Timing and/or Conflicts

We encourage that the Legislature bi-annually assess the effectiveness of the Water Supply Enhancement Plan (WSEP) and fund the program commensurate with its successes. We encourage the Texas State Soil and Water Conservation Board (TSSWCB) to annually prioritize its WSEP funding placement to target water supply concerns as noted above.

8.1.10 Inflows to Highland Lakes

8.1.10.1 Background Information

The Highland Lakes rely on inflows from contributing watersheds in maintaining regional water supply. Inflows to the Highland Lakes are produced when precipitation occurs in contributing watersheds in sufficient amounts to cause water to run off the land surface and accumulate as stream flows that are tributary to the Highland Lakes.

The Texas Water Development Board (TWDB) has undertaken two projects to evaluate rainfall-runoff trends in the Upper Colorado River Basin of Texas, including one site in the Region K area (the San Saba Watershed). In the August 2017 Phase I report (KRC, 2017, TWDB Contract #1600012011), it was noted that observed flows in the Upper Colorado River watershed declined at all study sites over the period 1940-2016. Declines at the majority of sites were attributed to historical water use and the construction of large upstream permitted reservoirs. Yet for some of the study sites (including those in the San Saba), observed flow declines exceeded the declines that would be attributed to permitted upstream withdrawals and reservoir storage.

Phase II of the study, which was finalized in September 2019 (TWDB Contract #1800012283), evaluated many potential causes for the reduced inflows identified in Phase I, and determined that for the San Saba watershed, the change was most likely a result of small pond usage and construction, though several potential factors were not able to be fully evaluated due to lack of data (e.g. groundwater pumping, noxious brush).

To the extent there may be a decreasing trend in inflows to the Highland Lakes it would largely be accounted for in water supply planning models through updates of the historical naturalized flow data, such as the recent update through 2016. Understanding the physical basis and magnitude of any trends would provide useful information for planning for future water supply.

8.1.10.2 Policy Statement

Data demonstrating reduced inflows to Lakes Buchanan and Travis in recent years have shown that further investigation and analysis may be valuable in the Region K watersheds. Research focusing on the inflows to the lakes is needed to understand and quantify these observations, so that the results can provide meaningful input to regional water modeling and planning activities. Future water planning activities should consider the impacts of land use/land cover and small impoundment on streamflow, potentially by adjusting both surface water WAMs and groundwater GAMs to account for current river basin characteristics.

8.1.10.3 Actions Needed

The LCRWPG recommends the State continue to provide funding for studies to evaluate rainfall-runoff trends in the Upper Colorado River Basin. Further study should include elements recommended the Phase II study, including:

1. Develop a semi- or fully- distributed rainfall/runoff model of the study area watersheds, that would be able to simulate both surface runoff and subsurface infiltration processes. The model should account for the extent and water usage properties of the noxious brush common to each watershed.
2. Further comprehensive study of the potential impacts of noxious brush, likely though modeling and empirical study of results generated from recently completed and published paired watershed studies.
3. Additional small pond analysis, including expanding the analysis to the entire Colorado River watershed and defining drainage areas for the ponds to allow better quantification of the impact of each pond to its local portion of the watershed. This analysis should facilitate modeling the rainfall-runoff response for the flow network over time.
4. Modeling future temperature and precipitation scenarios as derived from Global Climate model data.

In addition, since the Phase II study was not able to obtain sufficient groundwater pumping data to evaluate its impact on streamflows, the LCRWPG recommends future studies include an analysis focusing on identifying and quantifying the potential streamflow impacts of groundwater pumping from alluvial wells.

The purpose of these recommended studies is to further quantify the impacts of land use/land cover, surface water-groundwater interaction, and small impoundments on inflows to the Highland Lakes.

8.1.10.4 Timing and/or Conflicts

Given the importance of accurate inflow data on water supply planning, analyses and evaluations should continue in order to provide data for more accurate hydrologic modeling and planning.

8.1.11 Coordination of Planning Cycles for Determination of Desired Future Conditions by GCDs and Generation of the Regional Water Plan by RWPGs

8.1.11.1 Background Information

In 2005, Texas legislation required groundwater conservation districts (GCDs) to work together within their particular groundwater management areas (GMAs) to determine the desired future conditions (DFCs) of their shared aquifer. These conditions were to be reviewed every five years starting in 2010. The information compiled by the districts through this coordinated effort would be supplied to the appropriate regional water planning group which would in turn eventually be rolled into the state water plan.

Unfortunately, the five-year cycle for assessing desired future conditions by GCDs by GMAs continues to run almost parallel to the regional water planning cycle. The most recent DFCs are finalized by the GMAs after the deadline for submittal to the RWPG. As a result, the RWPG must rely on potentially outdated information from GCDs during the assessment period. In 2013, legislation (SB 1282) pushed the DFC deadline back from September 2015 to May 2016; however, this did not remedy the timing problem.

8.1.11.2 Policy Statement

The LCRWPG recommends staggering the five-year cycles for determination of DFCs by GCDs and the Regional Water Planning Group (RWPG) such that MAG estimates are available for consideration by RWPGs in advance of the deadline for the technical memorandum when determining projected water supplies, demands, and needs. Both cycles require the involved entities to undergo considerable technical evaluation and public review before final approval.

8.1.11.3 Actions Needed

State GMAs – Each of the 16 groundwater management areas should review this proposal and submit recommendations in favor of or in opposition to the proposal.

Texas Legislature – Introduce legislation to alter the planning cycle for GCDs to derive DFCs within their assigned GMA so that finalized data can go into the regional water planning process in a timely and useful fashion. GCDs should not be burdened with a compressed cycle in order to accomplish this action.

8.1.11.4 Timing and/or Conflicts

This should be addressed in the next legislative session so it can go into effect prior to the next planning cycle.

8.1.12 Recommended Improvements to the Regional Planning Process (SB 1 - 75th Legislature)

The following eight recommendations have been developed by the LCRWPG in order to improve the ongoing regional water planning process:

1. The LCRWPG continues to support action by the State to provide for the integration of water quantity (supply) and water quality planning. Improvements have been made but more coordination is needed between TWDB and TCEQ, especially in the area of permitting for new water supply projects, in order to facilitate the implementation of key water management strategies. TWDB, TCEQ and other state, local, and federal entities are doing a good job of providing a clearinghouse

for infrastructure funding options through the Texas Water Infrastructure Coordination Committee (TWICC). TWDB and TCEQ should also work to coordinate the regional planning process with the Texas Clean Rivers Program, which is a partnership that uses a watershed management approach to identify and evaluate water quality issues. The RWPGs are considering water quality issues during this revision to the plan and continued coordination with the Texas Clean Rivers Program is desirable.

2. The LCRWPG supports action by the State to continue to fund programs for the collection of water data and groundwater availability information, which remains a critical need in the planning process. The State should provide adequate, continuous funding in order to improve the collection, development, monitoring, and dissemination of such water data.
3. The LCRWPG continues to support action by the State to provide assistance to the RWPGs with public information materials and administrative support.
4. The LCRWPG continues to support action by the State to provide for the opportunity to have improved representation of women and minorities on the RWPGs to ensure a true diversity of interests.
5. The LCRWPG supports action by the State to structure the planning process to include environmental needs in order to get a clear picture of the amount of available water resources for all users. Environmental needs and water supply strategies should be planned for just like Agricultural, Municipal, Industrial and other uses in the state.
6. The LCRWPG supports adequate and timely state funding for the regional water planning process. This funding is critical for the development of long-term, sustainable, environmentally protective and conservation-effective water management strategies as well as the collection of water data and groundwater availability information, including the refinement of modeling data, public information materials, and administrative assistance.
7. The LCRWPG recognizes the importance of the role of the GMA planning process in determining groundwater availability for planning purposes and supports providing the necessary resources and technical support to facilitate effective water planning.
8. The LCRPWG supports the Texas Open Meetings Act, which encourages participation by all interested parties in governmental decision making. All regional water planning group meeting and committee meeting agendas are posted 72 hours in advance of the meetings and are open to the public. Public inputs and concerns during all meetings are encouraged by including at least one item on each agenda for public participation/comment. Allowing participation by committee members through conference calling during the committee meetings only would facilitate the ability of members representing all of the various constituencies and areas (including remote and outlying areas) in the regional water planning group to contribute their insights to the recommendations presented to the entire regional water planning group. Under current rules, regional water planning group members in remote and outlying areas have more difficulty and face a higher bar for participation in committee meetings, including their time and expenses, due to their location. Allowing conference calling for committee meetings only would allow for greater inclusion and participation throughout the regional water planning process. The LCRWPG recommends that the State Legislature amend Section 16.053(h)(12) of the Texas Water Code to allow committees or subcommittees of a regional water planning group to include telephone conference calling by members of the committee and members of the public in order to allow full participation by those members in remote and outlying areas who are unduly burdened by travel requirements.

8.1.13 Radionuclides in the Hickory and Marble Falls Aquifers

The ***Region "K" Water Supply Plan for the Lower Colorado Regional Water Planning Group, Volume I, December 2000*** provided background information and a policy recommendation on the issues surrounding radionuclides in the Hickory and Marble Falls aquifers. The following is an update of the issues and policy recommendation.

EPA (U.S. Environmental Protection Agency) revised the federal radionuclides regulations, which had been in effect since 1977, effective in 2003. Radionuclides emit ionizing radiation, which can cause various kinds of cancers, depending on the type and concentration of radionuclide a person is exposed to via drinking water. These rules cover man-made and naturally occurring radionuclides in drinking water and include a first-time standard for uranium. EPA revised this regulation in accordance with the requirements of the 1986 Amendments to the SDWA (Safe Drinking Water Act) and the 1996 Amendments to SDWA. The statute calls for regulation of radionuclides and a review of regulations every six years. Additionally, according to the SDWA Amendments, the EPA must maintain or provide for greater protection of the health of persons when revising regulations. The EPA reviewed the most current health, occurrence, treatment, and analytical methods in revising these regulations to ensure that safe drinking water is protective of public health.

The TCEQ received an extension from EPA and then adopted the provisions of the Radionuclides Rule into the Texas Administrative Code in December 2004.

The concentration of radionuclide contaminants in the water entering the distribution system shall not exceed the following maximum contaminant levels: combined radium (radium isotopes No. 226 and No. 228) cannot exceed 5 picoCuries/liter (pCI/l); gross alpha-radiation emitters cannot exceed 15 pCI/l (not including radon and uranium); and effective December 8, 2003, 30 micrograms per liter (g/L) for uranium. The Texas rules states that MCLs (maximum contaminant levels) for beta particle and photon radioactivity from man-made radionuclides in drinking water in community water systems are equivalent to the MCLs under 40 Code of Federal Regulations (CFR) §141.66(d) as amended and adopted in the CFR through December 7, 2000, which was adopted by reference. The Texas Rule contains applicability, monitoring, reporting, and public notification requirements, and analytical requirements for radionuclide contaminants and compliance determination.

There are several water utilities currently providing water to the public from the Hickory and Marble Falls aquifers where radionuclide contaminates occur. These include some within Burnet County and San Saba County, within the Lower Colorado Region, as well as within seven counties in Region F, Mason, Brown, Coleman, Concho, McCulloch, Menard, and Kimble. Safe drinking water is a concern of these utilities. With Commission approval, utilities may be able to continue to use the water and/or bottled water on a temporary basis while they seek a long-term solution. Efforts have been made and/or are underway to develop alternative water sources or effective treatment and radioactive waste disposal. These small towns and water utilities have limited financial resources with which to treat the groundwater for municipal uses.

The LCRWPG recommends the State should provide adequate funding for alternative water supplies or for water treatment and radioactive waste disposal for those rural communities that may lose their water supply if such financial support is inadequate. In addition, State agencies should develop disposal procedures to provide for the safe handling of the radioactive wastes derived from the treatment processes.

8.1.14 Planning for Droughts Worse than the Drought of Record

8.1.14.1 Background Information

Taking action to address potential droughts worse than the drought of record (DWDR) events should be an integral part of risk management and developing water supply resiliency in water planning with a 50-year horizon. The 2016 Region K Water Plan, like most Regional Plans and the State Water Plan, was developed around hydrology associated with the 1950's drought. During the planning process for the 2016 Region K Plan, the Lower Colorado River was experiencing a significant drought. In the time after work was completed on the 2016 Region K Plan, the drought of the 2010's was declared to be a drought worse than the drought of record (DWDR) and supplanted the 1950's drought as the new drought of record for the Lower Colorado River Basin. The drought of the 2010's is now the benchmark for Region K planning purposes. The drought of the 1950's ended in 1957, and the drought of the 2010's began in 2007. This represents a 50-year span between the previous drought of record and the new drought of record, which coincides with the planning horizon.

From the 2017 State Water Plan:

- The plans are based on future conditions that would exist in the event of a recurrence of the worst recorded drought in Texas' history – known as the "drought of record" – a time when, generally, water supplies are the lowest and water demands are highest.
- The goal of the water planning process is to ensure that we have adequate water supplies in times of drought.
- Texas has a long history of drought, and there is no sign of that pattern changing; in fact, recent droughts remind us that more severe drought conditions could occur in the future.
- In the 2017 plan, **6 of the 16 regional planning groups indicated potential new droughts of record for their regions[1]**, resulting in reduced estimates of existing surface water supplies. These weather assumptions, coupled with the fact that our state's population continues to boom, made this planning cycle the most challenging yet.

Planning for DWDR's is not currently a required part of the state or regional water planning framework. However, the Texas Water Development Board (TWDB) General Guidelines for Fifth Cycle of Regional Water Plan Development contain examples of measures for regional water planning groups (RWPGs) to use to address DWDR events. The Guidelines serve as a summary and augmentation of existing statutes and rules that govern regional and state water planning as described in Title 31 of the Texas Administrative Code (TAC) Chapters 355, 357, and 258. Two examples are identified in the Guidelines to help RWPGs address DWDR events[2]. Regions can request a variance to extend the hydrologic record to include "conditions that are worse than with the drought of record." Secondly, regions can request a variance to calculate reservoir safe yield. The Guidelines define reservoir safe yield as a modeling "modification to decrease the firm yield of a reservoir so that an identified annual volume is held in reserve in order to account for droughts worse than the drought of record." According to the 2016 Regional Plans, 7 of 16 regions[3] include safe yield modeling.

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[1] 2017 State Water Plan, Section 3.6.2, Potential new drought of record periods reported for regions A, B, C, F, G, and K.

[2] TWDB Guidelines, April 2018, Section 3.6.2, See examples 3 and 4.

[3] 2016 Regional Plans for regions A, B, C, F, G, N, and O.

The hydrologic records used to develop the State and Regional plans are relatively short for the purposes of characterizing the worst possible drought conditions. Region K, like many other RWPGs, uses a hydrologic record that begins with 1940 for a total possible period of record of less than 100 years. Within that period of record, many short-term droughts have occurred as well as two longer drought of record events. Given the inherent nature of the regular drought and flood conditions that Texas is known for and the limited hydrologic data available for characterizing water availability extremes, it is important that the risks of future DWDR events be studied and that thoughtful consideration be given in the State and Regional Plans.

8.1.14.2 Policy Statements

The LCRWPG supports, as a minimum, the continued use of drought of record conditions as a baseline hydrologic benchmark in the planning process. It is essential that adequate water supplies are available through at least a repeat of the known historical worst conditions. However, the LCRWPG also recognizes that DWDR events are prudent to anticipate, as one was recently experienced in the Lower Colorado River watershed. Therefore, planning for future DWDR events should be an integral part of risk management and developing water supply resiliency in water planning, especially when considering the relatively short hydraulic record, projections for fast population growth, and increasing demands over the planning horizon.

The LCRWPG recommends the following:

- The State should provide funding for a study to:
    - identify the potential incremental impacts to the State’s water resources for a range of DWDR events given the current planning process based on drought of record events,
    - recommend changes to the planning process to facilitate the development of water management strategies by RWPGs to address DWDR events, and
    - recommend methodologies for development of DWDR conditions for RWPGs to including in the planning process.
- Prior to the Sixth Cycle of Regional Water Planning, the TWDB should consider including in the Guidelines to RWPGs additional options and examples of variance requests to address DWDR planning.
- If appropriate, upon completion of the aforementioned study and prior to the Seventh Cycle of Regional Water Planning, the State should consider initiating a rulemaking process to amend TAC Title 31 Chapters 357 and 358 to incorporate planning for DWDR events and the associated water management strategies into the Regional and State Water Plans to improve risk management and the resiliency of future water supplies for the state.

8.1.14.3 Actions Needed

The Texas Legislature should appropriate funding to support a study regarding the potential impacts of DWDR events and, if appropriate, recommendations for incorporating DWDR event planning into the State and Regional Water Plans.

If appropriate, prior to the Sixth Cycle of Regional Water Planning, the TWDB should consider amending the Guidelines to the RWPGs to include additional options and examples of variance requests to address DWDR planning.

If appropriate, the State should consider amending title 31 Chapters 357 and 358 of the Texas Administrative Code to incorporate DWDR event planning in the Regional and State Water Plans.

8.1.14.4 Timing and/or Conflicts

Given the long time-frames associated with developing new water supplies or drought contingency measures sufficient to address DWDR events, the actions listed above should be taken immediately.

8.2 SUMMARY OF UNIQUE STREAM SEGMENT RECOMMENDATIONS

In accordance with the Texas Administrative Code 31 §357.8, RWPGs:

> *…may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment, and a site characterization of the stream segment documented by supporting literature and data.*

During the 2001 planning cycle, the LCRWPG reviewed information included in a list of Ecologically Significant Stream Segments within the Lower Colorado Regional Water Planning Area by Texas Parks and Wildlife (TPWD). From the information provided, the LCRWPG listed and provided background information on nine of the streams that were recommended by a subcommittee of the LCRWPG as warranting further study for potential designation as ecologically unique in the *2001 Region K Water Plan*. A tenth stream segment (Hamilton Creek) was added to this list as part of the *2006 Region K Water Plan*.

Within *Chapter 8* of the subsequent Region K Water Plans, the LCRWPG has continued to include the information on these ten streams and their recommendation for further study. No further study on any of the ten streams has taken place to date and no streams have been recommended by the LCRWPG for designation as "ecologically unique."

During the 2021 planning cycle, the Unique Stream Segments (USS) Committee met to discuss the history of the unique stream segment recommendation process the LCRWPG has gone through, and to determine what, if any, new actions needed to be taken.

The USS Committee developed recommendations for consideration by the full LCRWPG. The recommendations approved by the full LCRWPG at the April 24, 2019 Region K meeting include the following:

a. Before including in the Region K Water Plan any on-channel reservoir/dam water management strategies located on stream segments identified for further study for potential designation as ecologically unique in Chapter 8, Region K will conduct a higher level of additional screening, as defined by the LCRWPG, to determine potential ecological impacts. (Recommendation is not intended to include existing structures or diversion structures, recharge enhancement weirs, or flood control.)

b. The 2021 RWP will include a list of studies completed since 2000 relevant to segments listed in *Table 8A-1* in the 2016 RWP.

c. Recommend requesting sufficient funding from TWDB for the 2026 RWP to reevaluate stream segments based on criteria for potential identification as ecologically unique, using studies listed in *Action Item B*. Note that even if a reevaluated stream segment remains on the list of stream segments identified for further study for potential designation as ecologically unique in *Chapter 8*, or if stream segments are added to this list, the planning group, after weighing all considerations, may or may not choose to recommend the segments for designation as ecologically unique.

d. Request data from Region J and other relevant planning groups regarding any analysis of unintended consequences or other experiences resulting from unique stream segment designation.

e. Request a presentation from TWDB staff on 31 TAC §357.43 (b)(2) (see excerpt below) and how it has been implemented in regions with designated unique streams.

> *(2) For every river and stream segment that has been designated as a unique river or stream segment by the legislature, during a session that ends not less than one year before the required date of submittal of an adopted RWP to the Board or recommended as a unique river or stream segment in the RWP, the RWPG shall assess the impact of the RWP on these segments. The assessment shall be a quantitative analysis of the impact of the plan on the flows important to the river or stream segment, as determined by the RWPG, comparing current conditions to conditions with implementation of all recommended WMSs. The assessment shall also describe the impact of the plan on the unique features cited in the region's recommendation of that segment.*

The LCRWPG is currently working on developing a list of studies completed since 2000 relevant to the ten stream segments recommended for further study and expects to have the list included in the Adopted *2021 Region K Water Plan*.

No new unique ecological stream segments are recommended for further study by the LCRWPG for this planning cycle. The ten unique stream segment recommendations for further study from the *2006 Region K Plan*, which the LCRWPG continues to recommend for further study, can be found in *Appendix 8A*.

8.3 SUMMARY OF POTENTIAL SITES UNIQUELY SUITED FOR RESERVOIRS

In accordance with the Texas Administrative Code 31 §357.9, RWPGs:

> *…may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation, and expected beneficiaries of the water supply to be developed at the site.*

No potential reservoir sites were recommended for designation as unique by the LCRWPG in past planning cycles. No potential reservoir sites are recommended by the LCRWPG for this planning cycle.

APPENDIX 8A

Unique Stream Segment Recommendations for Further Study from the 2006 Region K Plan

This section provides background information on the ten streams in the Lower Colorado Region identified and recommended by the Subcommittee (originally the first nine during the 2001 planning cycle and the tenth during the 2006 planning cycle) as warranting further study for consideration of designation as ecologically unique (*Table 8A.1*).

Table 8A.1 Stream Segments Identified for Further Study for Potential Designation as Ecologically Unique

Stream Segment	Location
Barton Springs segment of the Edwards Aquifer	Recharge stretches of Barton, Bear, Little Bear, Onion, Slaughter, and Williamson Creeks in Travis and Hays Counties
Bull Creek	From the confluence with Lake Austin upstream to its headwaters in Travis County
Colorado River	Within TCEQ classified Segments 1409 and 1410 including Gorman Creek in Burnet, Lampasas, and Mills Counties
Colorado River	TCEQ classified Segments 1428 and 1434 in Travis, Bastrop, and Fayette Counties
Colorado River	TCEQ classified Segment 1402 including Shaws Bend in Fayette, Colorado, Wharton, and Matagorda Counties
Cummins Creek	From the confluence with the Colorado River upstream to FM 159 in Fayette County
Llano River	TCEQ classified Segment 1415 from the confluence with Johnson Creek to CR 2768 near Castell in Llano County
Pedernales River	TCEQ classified Segment 1414 in Kimball, Gillespie, Blanco, and Travis Counties
Rocky Creek	From the confluence with the Lampasas River upstream to the union of North Rocky Creek and South Rocky Creek in Burnet County.
Hamilton Creek	From the outflow of Hamilton Springs to the confluence with the Colorado River.

8A.1 Barton Creek Within the TCEQ Classified Stream Segment 1430 From the Confluence With Town Lake in Travis County to FM 12 in Hays County

Barton Creek is the TCEQ classified stream Segment 1430 and extends from the confluence with Town Lake in Travis County to FM 12 in Hays County. The creek is in the Central Texas Plateau ecoregion and the watershed lies within the live oak-ashe juniper woods vegetation association. Water quality is generally good to exceptional, although coliform levels are occasionally elevated after storm events. Nitrite levels can also be high due to the influence of groundwater. Substrate is typically limestone bedrock with rubble, boulders, and gravel. The upper portions of the streams are generally intermittent, except in spring-fed reaches, which limits aquatic habitat. A comprehensive list of literature about the Barton Springs portion of the Edwards aquifer was prepared by the City of Austin in collaboration with the Austin History Center, and is available at http://www.ci.austin.tx.us/aquifer/. Barton Creek meets the following criteria for designation as ecologically unique:

- Riparian Conservation Area: the lower end of the stream is in the City of Austin's Zilker Park
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages; the stream

exhibits high dissolved oxygen (DO) concentrations and a diverse and complex benthic macroinvertebrate community

- Endangered/Threatened Species: the stream contains the only known population of the Barton Springs salamander (*Eurycea sosorum*), a federally listed endangered species

8A.2 Bull Creek From the Confluence With Lake Austin Upstream to its Headwaters

Bull Creek lies wholly within Travis County in the northwest portion of the City of Austin (*Figure 8.2*). The watershed for the stream is approximately 32 square miles in a rapidly developing area. The watershed is located on the eastern edge of the Texas Hill Country and immediately west of the Balcones Fault Zone. Numerous seeps and springs provide baseflow to Bull Creek. Water quality is generally good, although some degradation has occurred due to development. The Bull Creek watershed contains suitable habitat for a variety of rare and endangered species including the Golden-Cheeked Warbler (*Dendroica chrysoparia*), Black-Capped Vireo (*Vireo atricapillus*), Tooth Cave spider (*Neoleptoneta myopica*), Tooth Cave pseudoscorpion (*Tartarocreagris texana*), Bee Creek Cave harvestman (*Texella redelli*), Bone Cave harvestman (*Texella redelli*), Tooth Cave ground beetle (*Rhadine persephone*), Kretshcmarr Cave mold beetle (*Texamaurops reddeli*), and Jollyville Plateau salamander (*Eurycea* sp.). In addition, the watershed contains a very diverse flora. Bull Creek meets the following criteria for designation as ecologically unique:

- Biologic Function: nearly pristine stream with a largely intact riparian area
- Hydrologic Function: pervious cover and intact riparian zone reduce downstream flooding
- Riparian Conservation Area: Bull Creek Preserve
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: overall pristine nature gives the stream a high aesthetic value; stream has a diverse and complex benthic macroinvertebrate community, and an abundance and diversity of amphibians
- Endangered/Threatened Species: the stream contains a population of the Jollyville Plateau salamander (*Eurycea* sp.), a federally listed endangered species

Figure 8A.1: Location and Map of Barton Creek Stream Segment 1430

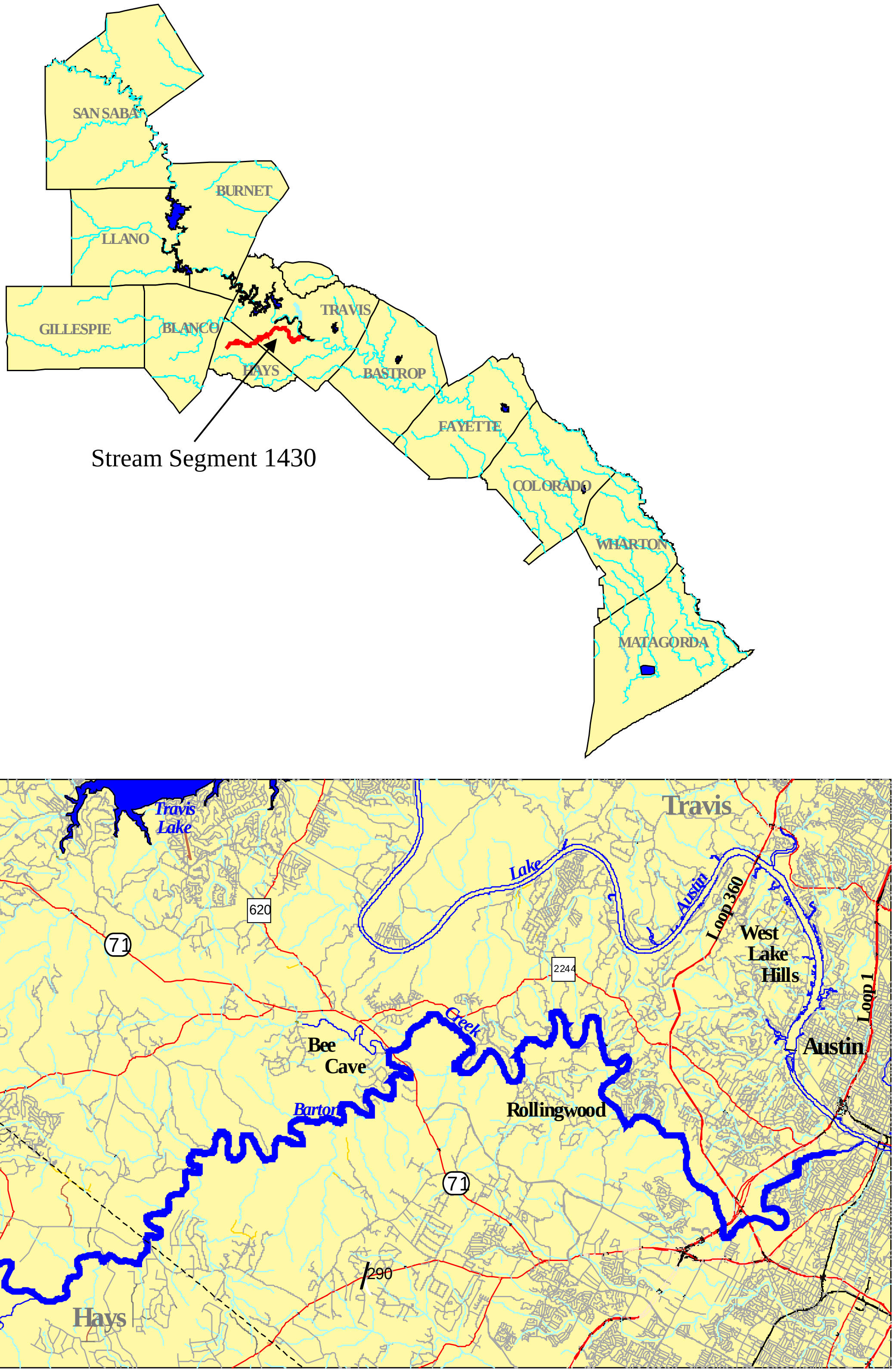
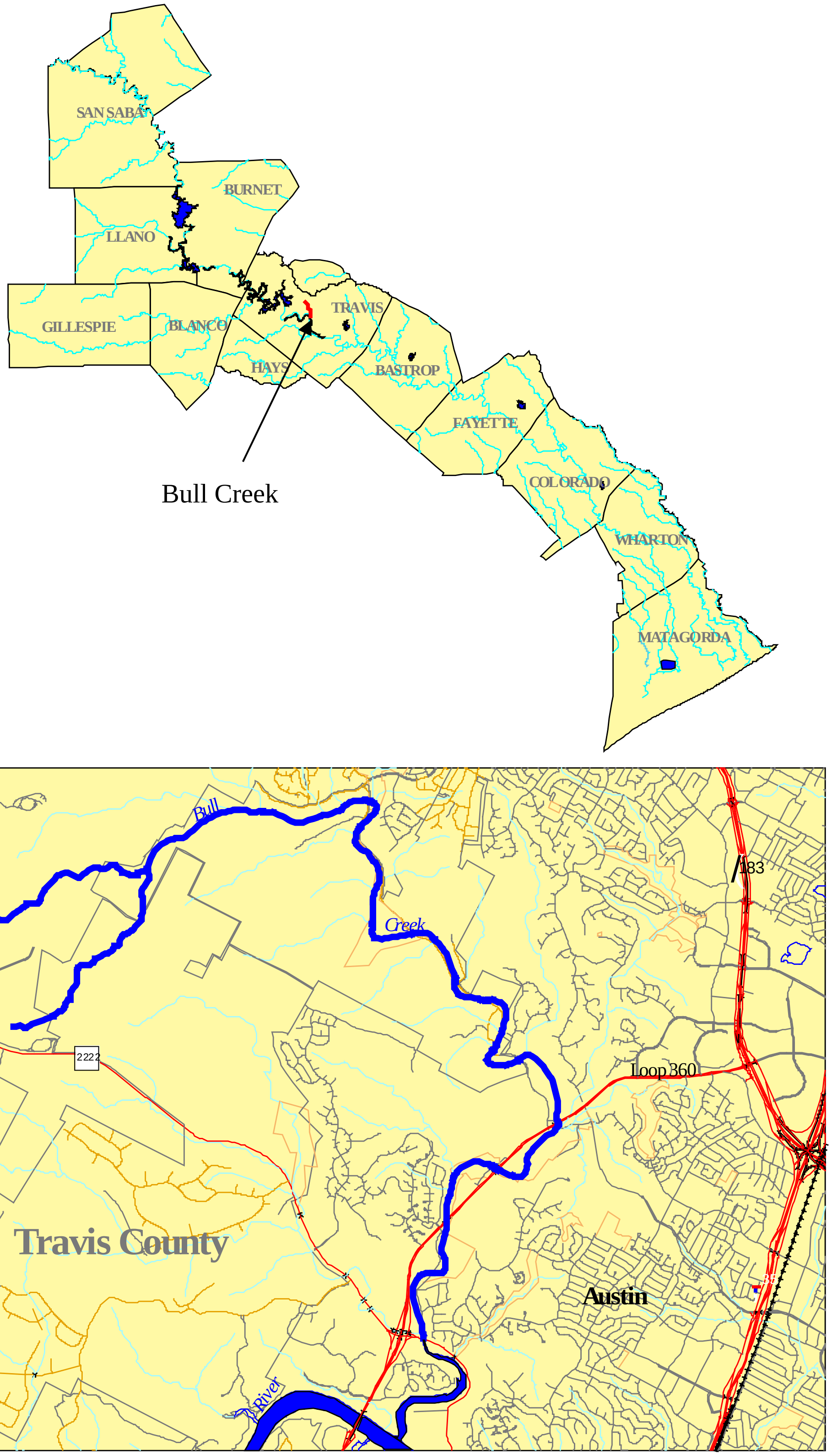


Figure 8A.2: Location of Bull Creek



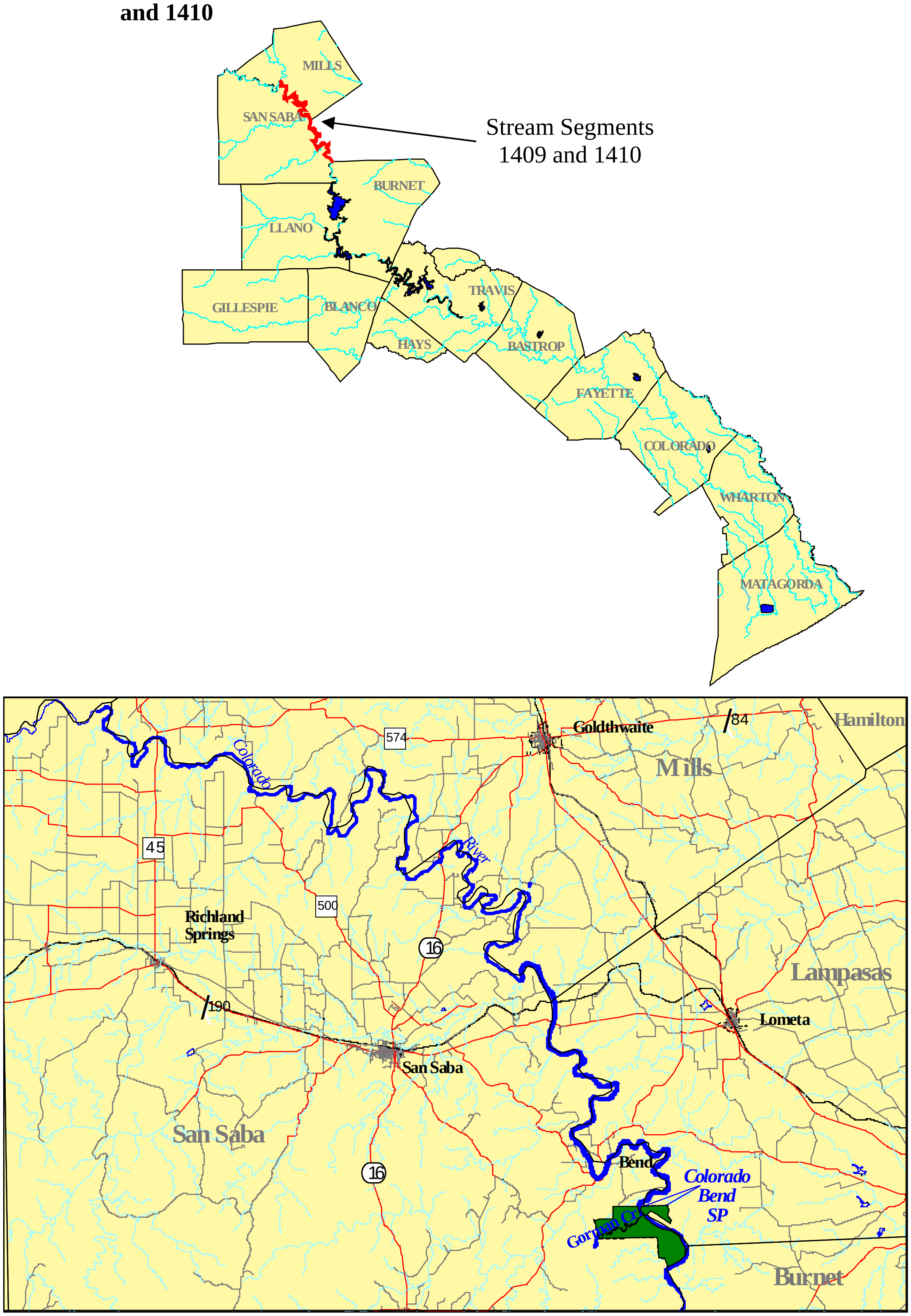
8A.3 Colorado River Within TCEQ Classified Stream Segments 1409 and 1410 Including Gorman Creek in Burnet, Lampasas, and Mills Counties

This segment consists primarily of the Colorado River upstream of Lake Buchanan to the Brown/San Saba/Mills county line, but also includes the Gorman Creek tributary (*Figure 8.3*). The stream segment is within the Central Texas Plateau ecoregion. Vegetation types common along the stream are mostly live oak-juniper parks. The river itself is wide and relatively shallow, flowing over a bed of limestone and gravel. A few stretches of small rapids exist on the upper part of this section down to the point where the backwaters of Lake Buchanan deepen the river and slow its flow.

Among the segment's scenic attributes are high limestone bluffs, vistas of rugged cedar-covered hills, and the existence of one of the most spectacular waterfalls in Texas. Gorman Falls is formed at the point where Gorman Creek tumbles into the Colorado River over a 75-foot-tall limestone bluff. The water coming from the creek is clear and cold, and many ferns and mosses grow on the slippery rocks and travertine deposits below the falls. The TCEQ identifies the segment as having a high aquatic life use. The National Park Service identified the segment for inclusion in the National Rivers Inventory based on the degree to which the river is free-flowing, the degree to which the river and corridor is undeveloped, and the outstanding natural and cultural characteristics of the river and its immediate environment. The segment meets the following criteria for designation as ecologically unique:

- Biologic Function: white bass spawning area
- Riparian Conservation Area: Colorado Bend State Park
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: exceptional aesthetic value
- Endangered/Threatened Species: Concho water snake (Nerodia paucimaculata), a federal and state listed endangered species, as well as the rare and endemic mollusks, Texas fawnfoot and Texas pimpleback

Figure 8A.3: Location of the Colorado River Within TCEQ Classified Stream Segments 1409 and 1410

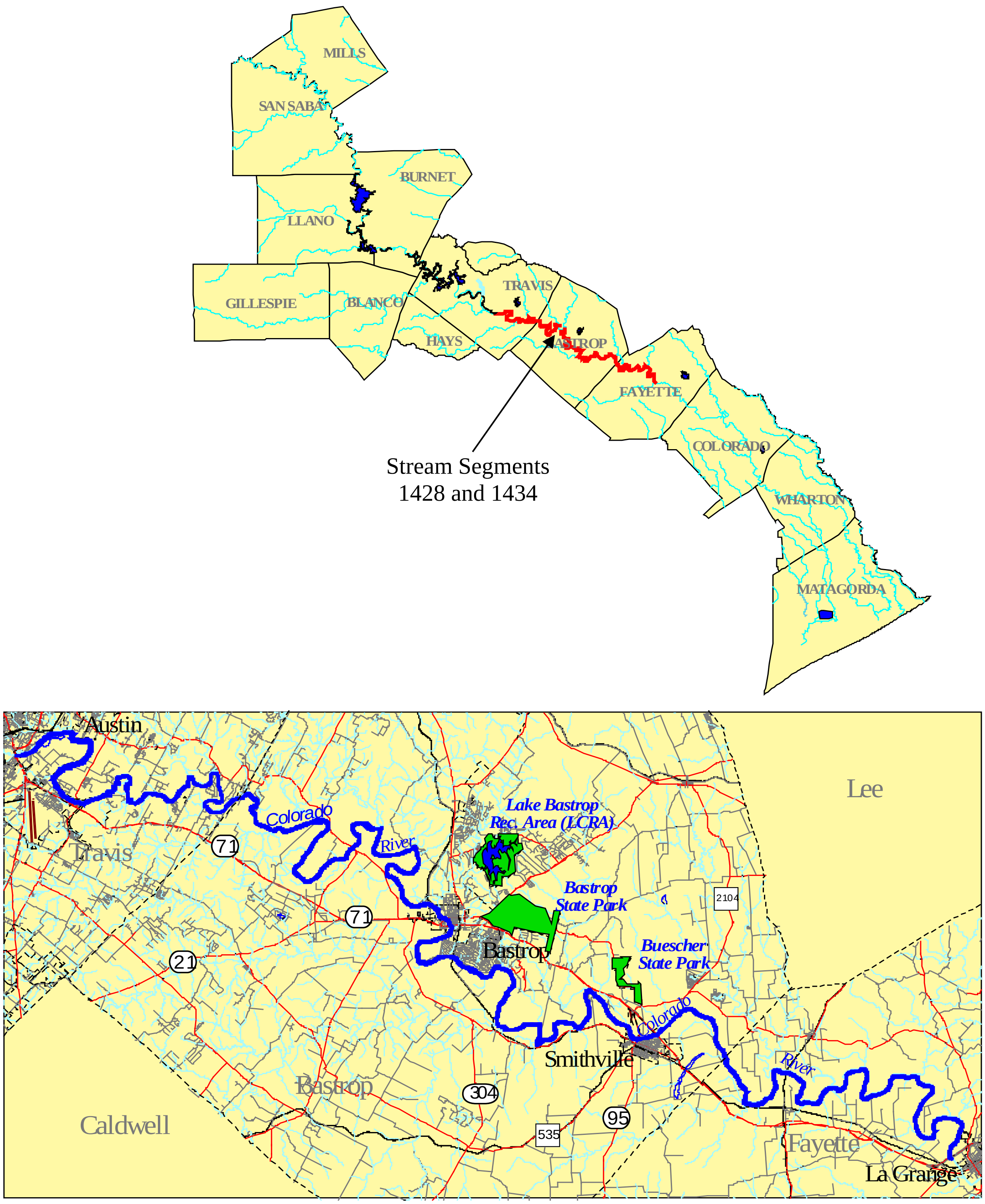


8A.4 Colorado River Within TCEQ Classified Stream Segments 1428 and 1434 in Travis, Bastrop, and Fayette Counties

The segment includes the Colorado River from a point 100 meters downstream of SH 71 in La Grange to Longhorn Dam in Austin and portions of Wilbarger, Big Sandy, Alum, and Cedar Creeks in Bastrop County (*Figure 8.4*). Extensive information about the segment in Bastrop County, submitted by the Bastrop County Environmental Network (BCEN), is presented in *Appendix 8B*. In general, water levels in the Colorado River are controlled by releases from Lake Travis and Lake Buchanan. The occurrences of low instream flows often depend on the discharge rate of return flows from the City of Austin. Instream flows in the smaller creeks within Bastrop County originate from diffuse surface water runoff, groundwater contributions, and springs. The segment lies within the Texas Blackland Prairies ecoregion. Substrate in the streams is typically sand and/or gravel. Several reaches of the segment are characterized by rubble and boulder fields. The TCEQ has classified the mainstem river as supportive of exceptional aquatic life uses. Water quality is generally good although nutrient levels are often elevated. Water quality in the creeks is typically good but influenced by flow levels, land use patterns, and wastewater discharges. Cedar Creek contains an exceptional macroinvertebrate community and, based on the ichthyofauna, a high Index of Biotic Integrity rating. This portion of the Colorado River has a diverse fish community, including the state listed threatened blue sucker (*Cycleptus elongatus*). In addition, the state and federally listed endangered Houston toad (*Bufo houstonensis*) occurs in the area. The segment meets the following criteria for designation as ecologically unique:

- <u>Biologic Function</u>: undeveloped riverine habitat, part of the Central Flyway of migratory birds
- <u>Hydrologic Function</u>: extensive riparian zone attenuates flooding and improves water quality via filtration and soil stabilization; riparian and stream channels hydrologically connected to an alluvial aquifer and the Carrizo-Wilcox aquifer
- <u>Riparian Conservation Area</u>: McKinney Roughs Environmental Learning Center
- <u>High Water Quality/Exceptional Aquatic Life/High Aesthetic Value</u>: exceptional aquatic life use
- <u>Endangered/Threatened Species</u>: blue sucker (*Cycleptus elongatus*), a state listed endangered species and the federal and state listed endangered Houston toad (*Bufo houstonensis)*

Figure 8A.4: Location of the Colorado River Within TCEQ Classified Stream Segments 1428 and 1434



8A.5 Colorado River Within the TCEQ Classified Stream Segment 1402 in Fayette, Colorado, Wharton, and Matagorda Counties

The segment extends from just downstream of the Missouri-Pacific Railroad trestle in Matagorda County to a point 100 meters downstream of SH 71 in La Grange, a distance of 150 miles (*Figure 8.5*). The segment lies within the Texas Blackland Prairies ecoregion and flows into the East Central Texas Plains ecoregion. Substrate varies from primarily gravel in the upper reaches of the segment to gravel/cobble riffles and extensive sand-dominated reaches downstream. Instream flow is largely dependent on upstream releases for rice irrigation but also receives contributions from the intervening watershed. The water quality of the segment is typically good and supports a high aquatic life use designation. Nutrient levels are elevated, but DO concentrations are typically higher than the minimum required to maintain a high aquatic life use designation. The fish community is generally diverse and includes the blue sucker (*Cycleptus elongatus*), a state listed endangered species. Although not contained in this report, additional information about the segment is available in feasibility studies performed by ECS Technical Services for the U.S. Department of the Interior, which includes the proposed Shaw's Bend Reservoir site in Colorado County. The segment meets the following criteria for designation as ecologically unique:

- <u>Biologic Function</u>: undeveloped riverine habitat, part of the Central Flyway of migratory birds
- <u>Endangered/Threatened Species</u>: blue sucker (*Cycleptus elongatus*), a state listed endangered species

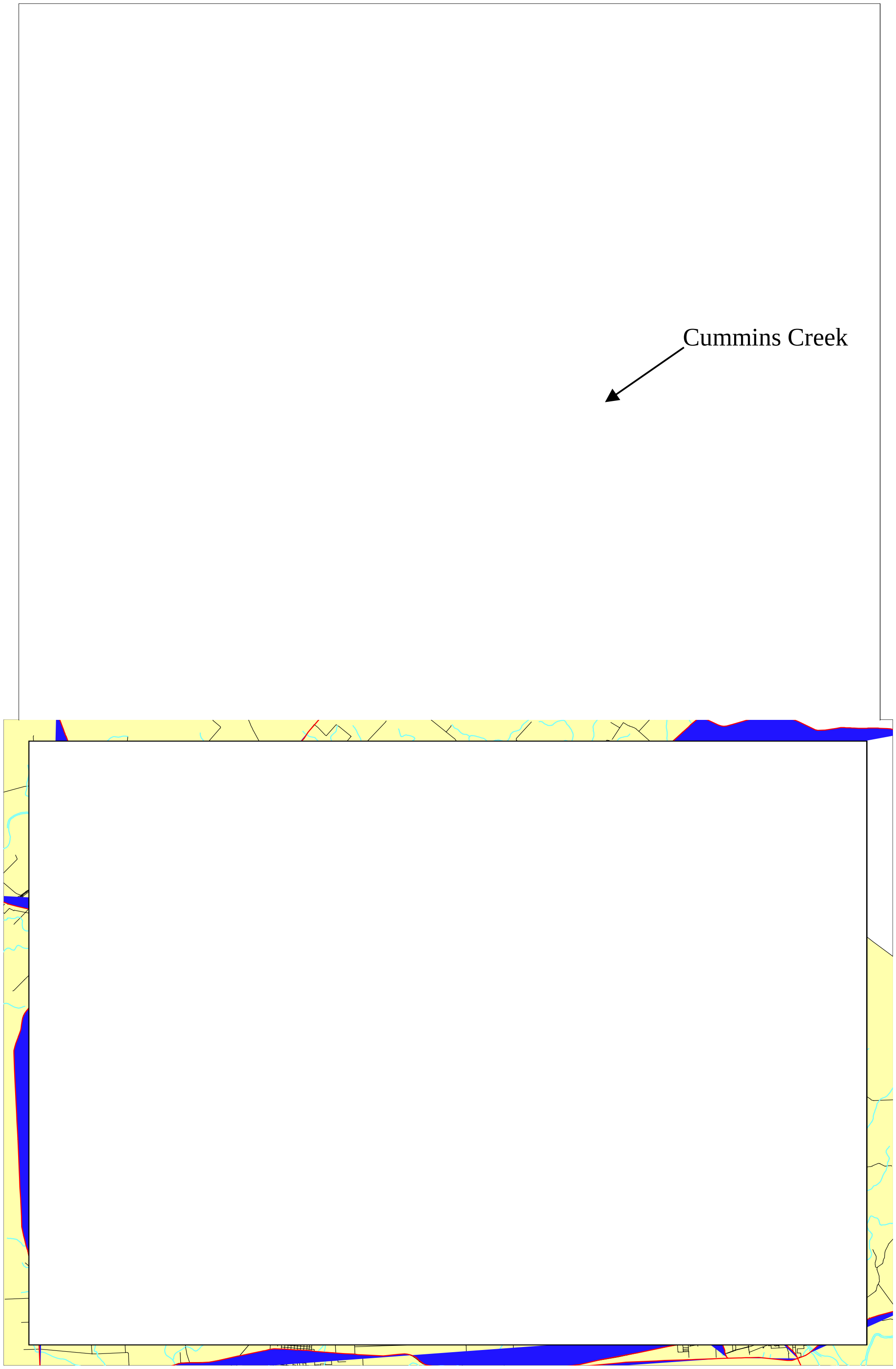
8A.6 Cummins Creek From the Confluence With the Colorado River in Colorado County Upstream to FM 159 in Fayette County

Cummins Creek lies within the Texas Blacklands Prairie ecoregion in Colorado and Fayette Counties (*Figure 8.6*). The stream is characterized by shallow to moderately deep pools, riffles, and occasional shallow runs. Substrate is predominantly fine sands with gravel and rubble in riffles and runs. Cummins Creek is within the post oak savannah vegetation region. The surrounding land use is mostly agricultural. Water quality is generally good, and the stream supports diverse macroinvertebrate and fish communities. The LCRA rated the creek, which has at least 27 species of fish as suitable for a high aquatic life use for fish. Among the fish species that have been collected in the stream is the Guadalupe bass (*Micropterus treculi*). Cummins Creek supports at least 28 species of aquatic macroinvertebrates. Several varieties of mayflies and caddisflies, which are considered intolerant of pollution, are present. Cummins Creek was rated an excellent aquatic life use category for macroinvertebrates based on work by the LCRA. The segment meets the following criteria for designation as ecologically unique:

- <u>High Water Quality/Exceptional Aquatic Life/High Aesthetic Value</u>: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages the stream
- <u>Exhibits High Dissolved Oxygen Concentrations and a diverse and complex benthic macroinvertebrate community</u>

Figure 8A.5: Location of the Colorado River Within the TCEQ Classified Stream Segment 1402

Figure 8A.6: Location of Cummins Creek



8A.7 Llano River Within the TCEQ Classified Stream Segment 1415 From the Confluence With Johnson Creek to County Road 2768 Near Castell in Llano County

The Llano River between the confluence with Johnson Creek and County Road (CR) 2768 in Llano County is part of TCEQ classified stream Segment 1415 (*Figure 8.7*). The Llano River is a spring-fed stream of the Edwards Plateau and is widely known for its scenic beauty. It is in the Central Texas Plateau ecoregion and is characterized by the live oak-mesquite parks vegetation type. Riparian vegetation includes elm, willow, sycamore, and salt-cedar. The stream has designated water uses for contact recreation, as a public water supply, and for high aquatic life uses. Among the fish found in the stream is the Guadalupe bass (*Micropterus treculi*). The substrate is composed of limestone bedrock and gravel. In addition, large boulders and slabs of granite and gneiss occur in the river. This section of the Llano River is widely known for the one-billion-year-old igneous and metamorphic rocks, which form the riverbed. The area is a part of the Llano Uplift, which is one of the most unique geologic features in Texas. Land use along the stream is generally rural and includes ranching and agriculture. The segment meets the following criteria for designation as ecologically unique:

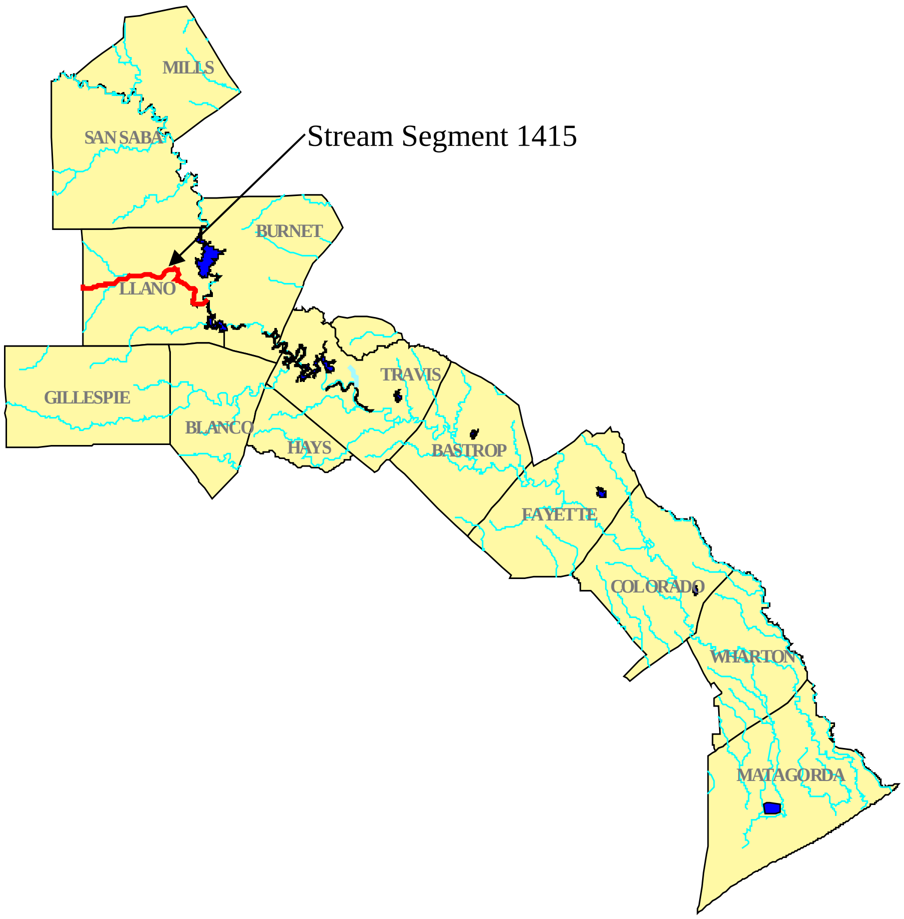
- <u>High Water Quality/Exceptional Aquatic Life/High Aesthetic Value</u>: exceptional aesthetic value

8A.8 Pedernales River Within the TCEQ Classified Stream Segment 1414 in Kimball, Gillespie, Blanco, and Travis Counties

The Pedernales River from a point immediately upstream of the confluence of Fall Creek in Travis County upstream to FM 385 in Kimble County makes up the TCEQ classified stream Segment 1415 (*Figure 8.8*). Most of this segment lies within the LCRWPA. The Pedernales River in general has high water quality and supports a high aquatic life use. The stream is within the Central Texas Plateau ecoregion. Surrounding vegetation is characteristic of the live oak-ashe juniper parks and live oak-mesquite-ashe juniper parks vegetation regions. The river is spring-fed and free flowing, with many limestone outcroppings. The National Park Service identified the segment for inclusion in the National Rivers Inventory based on the degree to which the river is free flowing, the degree to which the river and corridor is undeveloped, and the outstanding natural and cultural characteristics of the river and its immediate environment. Bald cypress, red columbine, and native orchids are found adjacent to the river. Among the fish species that occur in the stream is the Guadalupe bass (*Micropterus treculi*). Other aquatic species typical of Hill Country spring-fed streams also inhabit the Pedernales River. Along the river are several state and national parks including Pedernales Falls State Park, LBJ State Park, and LBJ National Park. The segment meets the following criteria for designation as ecologically unique:

- <u>Biologic Function</u>: significant natural area
- <u>Riparian Conservation Area</u>: Pedernales Falls State Park, LBJ State Park, LBJ National Park, and Stonewall Park
- <u>High Water Quality/Exceptional Aquatic Life/High Aesthetic Value</u>: exceptional aesthetic value

Figure 8A.7: Location of the Llano River From Johnson Creek Confluence to CR 2768



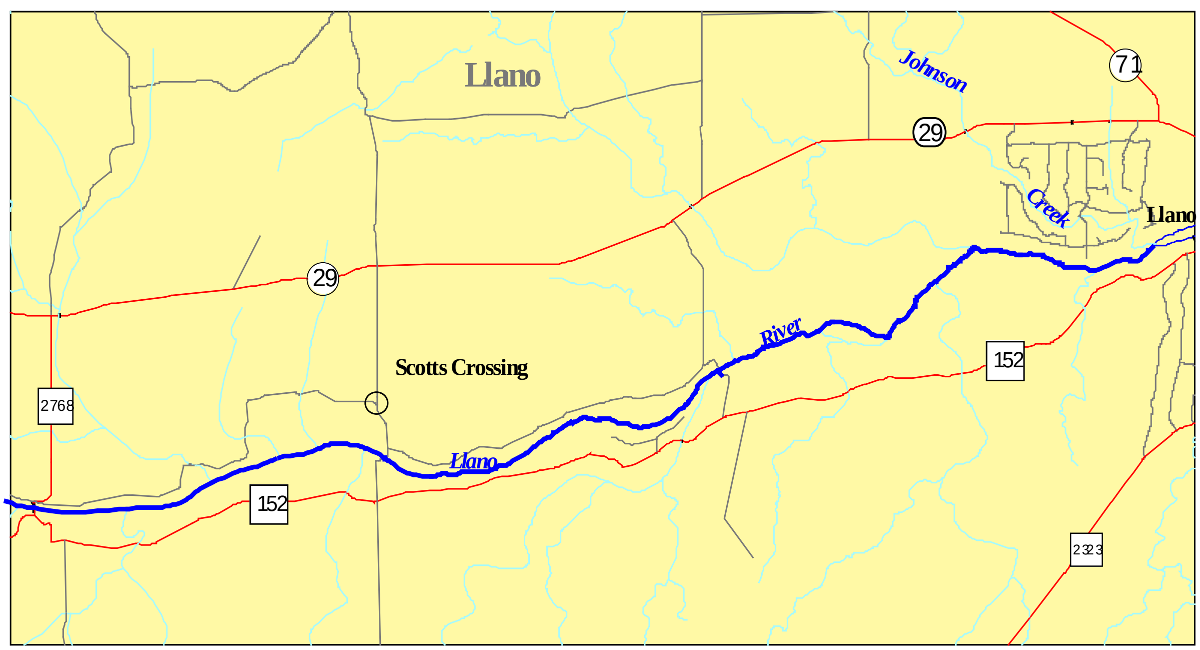
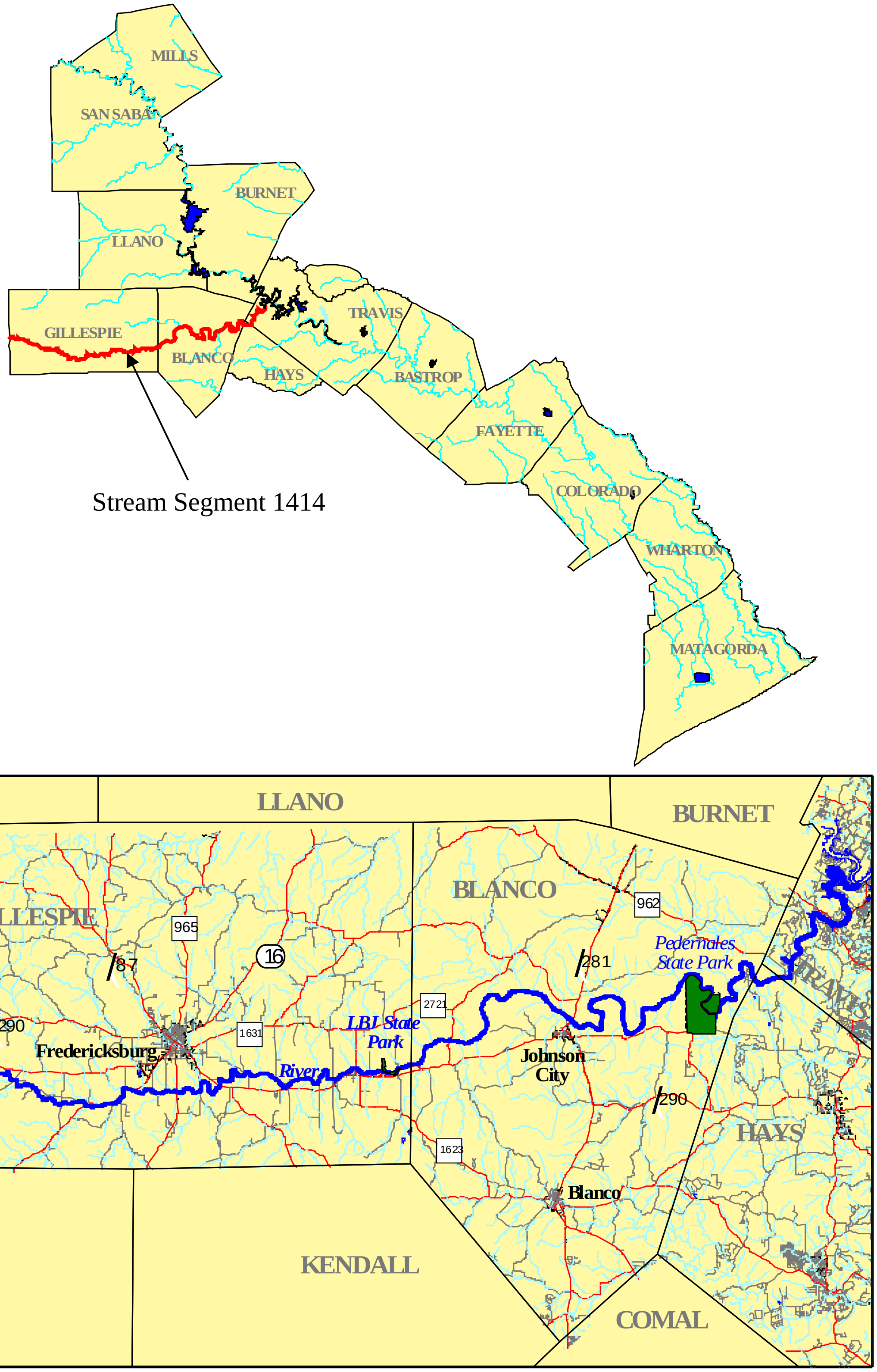


Figure 8A.8: Location of the Pedernales River Within the LCRWPA



8A.9 Rocky Creek From the Confluence With the Lampasas River Upstream to the Union of North Rocky Creek and South Rocky Creek in Burnet County

Rocky Creek lies within the Brazos River Basin in northeast Burnet County (*Figure 8.9*). The stream is approximately 6 miles long with a drainage area of 94 square miles. The stream is in the Central Texas Plateau ecoregion and within the oak-mesquite-juniper parks/woods vegetation association. The upper reach flows through the live oak-ashe juniper parks association. Long deep runs with numerous short riffles and occasional deep glides characterize the creek morphology. Limestone bedrock, gravel, and rubble are the dominant substrate types. In sampling for the Texas Aquatic Ecoregion Project, 54 species of aquatic invertebrates and 15 species of fish were collected. The segment meets the following criteria for designation as ecologically unique:

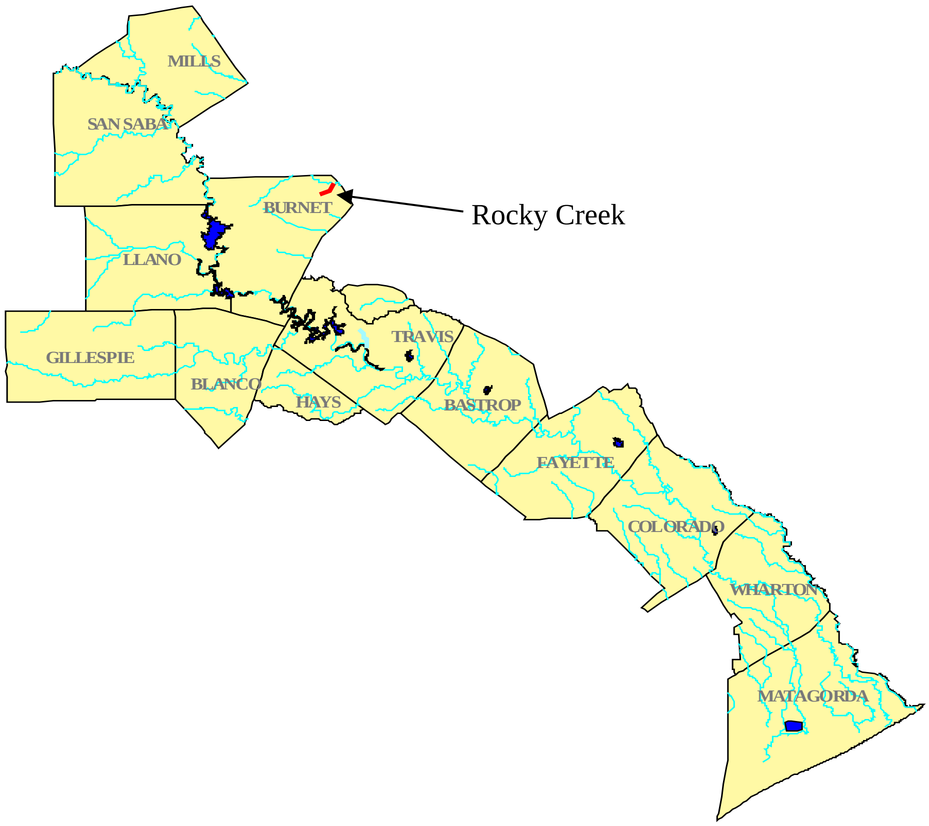
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages; the stream exhibits high DO concentrations and a diverse and complex fish and benthic macroinvertebrate community.

8A.10 Hamilton Creek From the Confluence With the Colorado River Upstream to the Outflow of Hamilton Springs in Burnet County

Hamilton Creek originates at Hamilton Springs in south central Burnet County 5 miles northwest of Burnet and flows south for 22 miles to its confluence with the Colorado River in TCEQ classified stream segment 1404 (*Figure 8.10*). The upper reaches of Hamilton Creek are intermittent with flow increasing downstream due to municipal discharges from the City of Burnet and other sources. The stream flows through the Edwards Plateau ecoregion, a region of limestone outcrops and a mixture of granitic and sandy soils. Throughout the Edwards Plateau live oak, shinnery oak, mesquite and juniper dominate the woody vegetation. There is a limited riparian cover adjacent to the stream. TCEQ identifies Hamilton Creek as Segment 1404A with water body uses for contact recreation and fish consumption with an intermediate aquatic life use.

Following the adoption of the Region K Water Supply Plan, the LCRWPG was made aware of a proposed open pit mine being considered in Burnet County adjacent to Hamilton Creek. Local residents in the area around Hamilton Creek came to the RWPG indicating that the pristine nature of the creek was unique and worthy of consideration as a Unique Steam Segment (USS). The hope was that such a designation would protect the creek from potential adverse impacts due to the proposed mining operation. The RWPG, on December 11, 2002, took action on this request by authorizing the issuance of a letter from the RWPG to the TCEQ and the LCRA expressing concerns about excessive water mining and non-point source pollution damage to the creek. At the February 12, 2003, RWPG meeting, the group approved the recommendation that Hamilton Creek, from the outflow of Hamilton Springs to the Colorado River, be designated as a USS and that the recommendation be submitted to a local legislator for consideration during the 78th Legislative Session. The designation of Hamilton Creek as a USS was not passed during the 78th Texas Legislative Sessions.

Figure 8A.9: Location of Rocky Creek in Burnet County



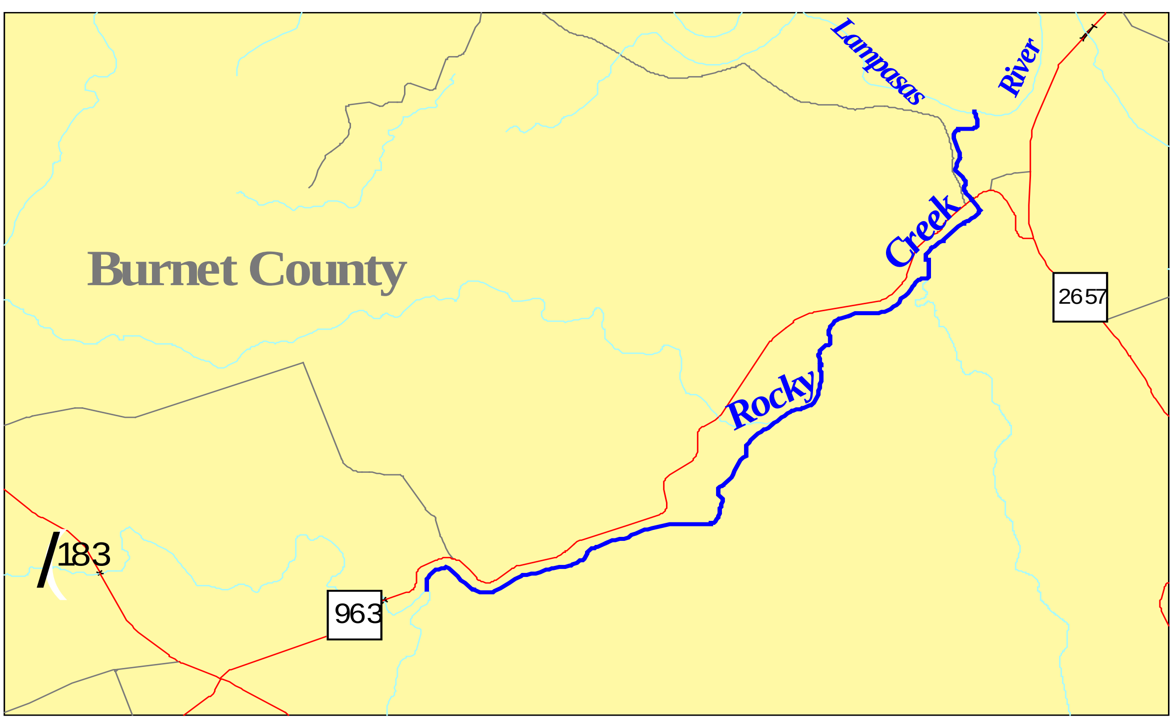
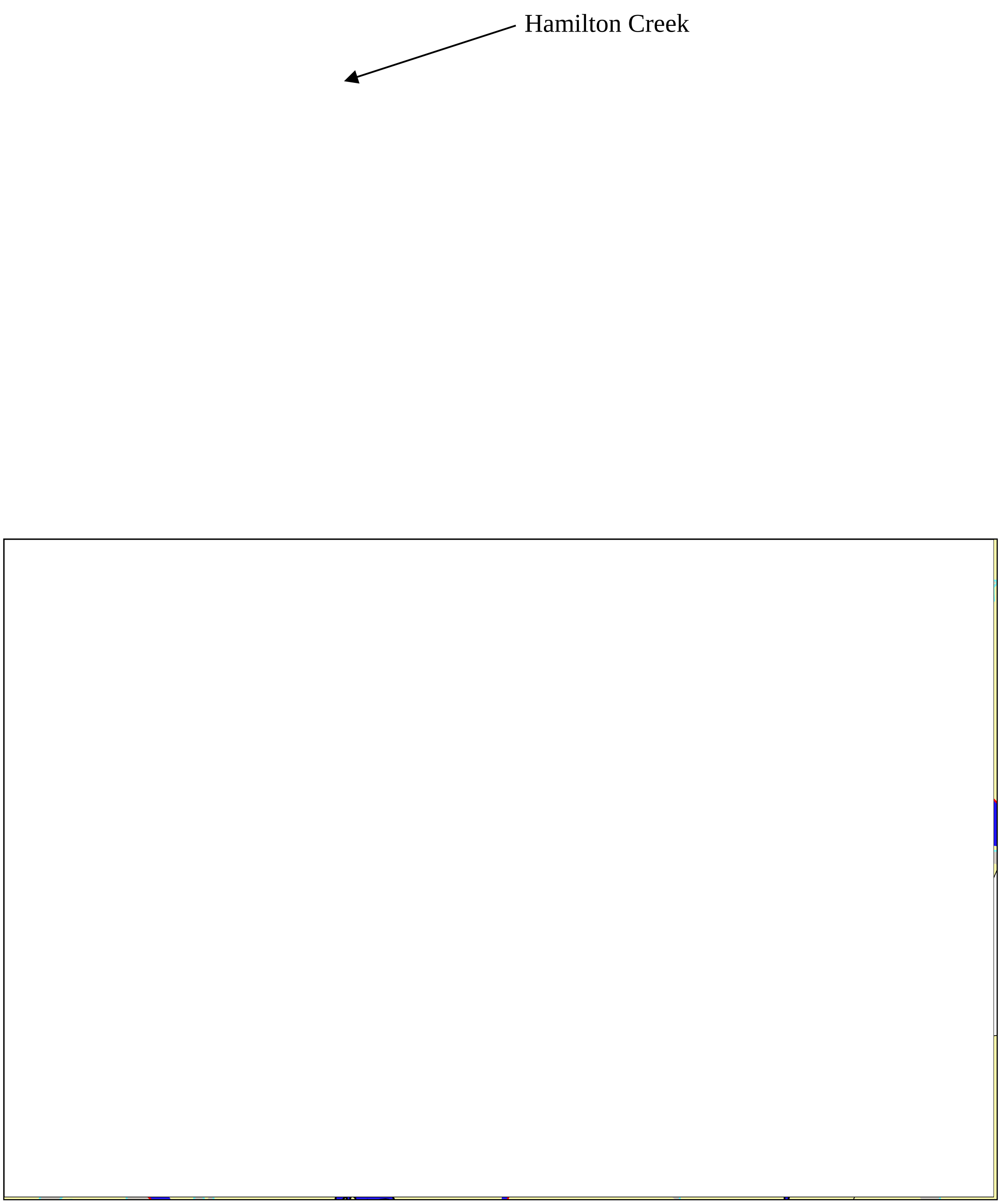


Figure 8A.10: Location of Hamilton Creek in Burnet County



8A.11 Conclusions and Recommendations

The protection intended to be provided by the designation of a river or stream segment as ecologically unique is to preclude a state agency or political subdivision of the state from financing the actual construction of a reservoir in a specific river or stream segment designated by the legislature as ecologically unique. In addition numerous programs presently exist to protect areas of special ecological significance. Since the LCRWPG currently has not recommended strategies for state financed reservoirs on any of the ten identified stream segments, and in the absence of additional environmental data, the LCRWPG takes no action at this time to designate these stream segments as ecologically unique. However, further study may be warranted in future Lower Colorado Regional Water Plans.

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CHAPTER 9.0: WATER INFRASTRUCTURE FINANCING RECOMMENDATIONS

9.1 INTRODUCTION

Infrastructure financing needs have long been a key concern of the Texas Water Development Board (TWDB) as it pursues its mission of providing adequate funding to timely meet local water needs. The 77th Legislature, in Senate Bill (SB) 2, added the formal preparation of an Infrastructure Financing Report (IFR) to the regional planning process. The purpose of the IFR is to determine the amount of funding needed from outside sources to implement Region K's management strategies as recommended in the 2021 Regional Plan. The intent of this portion of Chapter 9 is to present the following:

- The total capital cost of all the improvements recommended in the management strategies portion of the Plan.
- The results of the Infrastructure Survey letters that were sent by the Regional Water Planning Group (RWPG) to each identified municipal water user group (WUG) that had a recommended water management strategy that required a capital cost.
- An estimate of the capital cost of the Plan improvements that cannot be funded out of local revenues and funding sources.
- A review of the funding options listed in the responses to the Infrastructure Survey letters.
- A review of the Policy Statements in *Chapter 8* that the RWPG adopted that dealt with funding issues.

[REMAINDER OF INTRODUCTION TO BE PROVIDED AS PART OF FINAL PLAN]

9.2 CAPITAL COSTS FOR THE 2021 REGION K WATER PLAN

[SECTION TO BE PROVIDED AS PART OF FINAL PLAN]

9.3 ANALYSIS OF POSSIBLE FINANCING OPTIONS

[SECTION TO BE PROVIDED AS PART OF FINAL PLAN]

9.4 REGION K POLICY STATEMENTS FROM CHAPTER 8 THAT DISCUSS FUNDING

[SECTION TO BE PROVIDED AS PART OF FINAL PLAN]

APPENDIX 9A

TABULATED SURVEY RESULTS

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CHAPTER 10.0: PUBLIC INVOLVEMENT ACTIVITIES

10.1 OVERVIEW

The Lower Colorado Regional Water Planning Group (LCRWPG) made a commitment to conducting public outreach as a part of its duties as Planning Group members.

Major aspects of this effort included:

- **Holding 21 open regular meetings of the Planning Group** for presentation of material, discussion, deliberation, voting on specific measures, and public comment between February 2016 and February 2020. Members of the public attended all these meetings, which were posted on the Texas Secretary of State website and the Region K website in accordance with the Open Meetings Act. Every meeting included a scheduled time for public comment and questions. All the meetings were held in Austin in Travis County.
- **Holding a public meeting to receive input by the public** on the scope of work for the 2021 Region K Water Plan. This meeting was held on April 13, 2016. Resulting comments from the public are summarized in a table in *Appendix 10A*.
- **Holding a Water Planning 101 meeting** for new Region K members on March 9, 2016. This meeting had notice posted and was open to the public.
- **Serving as speakers at various civic and interest group meetings** representing a wide spectrum of interests and public opinion. These presentations took place throughout the planning period and in various counties of the region.
- **Conducting surveys** to obtain feedback on population and water demand projections and to obtain information regarding water supplies, water management strategies, and implementation of projects from the 2016 Plan.
- **Maintaining a web page** with documentation and notices of meetings and discussions, with links from the LCRA home page and the Texas Water Development Board (TWDB) website.
- **Using Committees** in order to assist in the review, consideration, and determination of the methodologies used to complete various parts of the 2021 Plan. Meetings were open to the public and many allowed for a more open dialogue between committee members and the public during the meeting.
- **Developing policy statements** through the Region K Legislative Committee regarding public involvement that have been adopted by Region K, and which are located in *Chapter 8* of this report.

Additional details will be provided as part of the Final Adopted 2021 Region K Water Plan.

The following sections detail the activities of the Regional Water Planning Group (RWPG) members.

10.2 PLANNING GROUP MEETINGS THROUGHOUT THE REGION

Regular Planning Group Meetings

Twenty-one (21) regular Planning Group meetings were held between February 2016 and February 2020 for presentation of material, discussion, deliberation, voting on specific measures, and public comment. These meetings were mainly held in Austin (in LCRA Dalchau Service Center). *Table 10.1* provides information on the feedback and comments received at the meetings.

Table 10.1: LCRWPG Publicized Regular Planning Group Meetings

Date	Meeting Location	# Public Attending	Public Comments
2/10/2016	LCRA Dalchau Service Center, Austin	15	None
4/13/2016	LCRA Dalchau Service Center, Austin	19	None
7/13/2016	LCRA Dalchau Service Center, Austin	10	None
10/12/2016	LCRA Dalchau Service Center, Austin	14	None
1/11/2017	LCRA Dalchau Service Center, Austin	14	Steven Cortez (Averitt and Associates) provided information on a statewide study to quantify water savings from planned water conservation efforts in the regional plans. David Lindsay provided comments on behalf of the Central Texas Water Coalition (CTWC) related to comments provided on water demand projections for irrigation. Mr. Lindsay indicated that CTWC submitted comments to TWDB on changing the basis for the agricultural irrigation methodology aimed at building a stronger baseline for projections.
4/26/2017	LCRA Dalchau Service Center, Austin	11	Jordan Furnans (LRE Water) discussed the ongoing research funded by TWDB on subsidence risk statewide being performed by LRE Water and requested if any of the members were aware of any subsidence evidence or features to please let him know. The project is a year-long study.
7/12/2017	LCRA Dalchau Service Center, Austin	17	Jordan Furnans (LRE Water) spoke to the group about zebra mussels in the Highland Lakes, and how a Company called Environmental Quality and Operations (EQO) is working with the Texas Parks and Wildlife Department to help support efforts to limit the spread of zebra mussels. Dr. Furnans offered to speak to any organizations about how EQO can help in efforts combating zebra mussels.
10/11/2017	LCRA Dalchau Service Center, Austin	15	None

Date	Meeting Location	# Public Attending	Public Comments
1/10/2018	LCRA Dalchau Service Center, Austin	20	Jordan Furnans (LRE Water) made a comment related to water modeling done by the RWPG. He stated that he has performed studies on modeling sedimentation and environmental flows, and both their effects on the firm water available in the WAM are minimal compared to modeling interruptible water. He encouraged the Group to keep in mind the impact of modeling interruptible water on the firm water available.
4/11/2018	LCRA Dalchau Service Center, Austin	15	Jordan Furnans (LRE Water) - take land subsidence into account when considering groundwater water management strategies related to groundwater pumping, as he recently provided TWDB with a report on the relationship of groundwater pumping and subsidence. Written comment provided by Jordan Furnans: To inform group of TWDB Subsidence Study Results and Availably of report/information.
7/11/2018	LCRA Dalchau Service Center, Austin	22	Troy Wenzel, Assistant Fire Chief at Pedernales Fire Department, Travis County, communicated his concern that their fire department relies on water from the Highland Lakes and that the lakes levels are falling. Low levels in the lakes mean their pumps cannot access water to fight fires. He would like the Region K group to take this into consideration in their decisions throughout the process.
8/29/2018	LCRA Dalchau Service Center, Austin	13	None
10/24/2018	LCRA Dalchau Service Center, Austin	7	None
1/9/2019	LCRA Dalchau Service Center, Austin	9	None
4/24/2019	LCRA Dalchau Service Center, Austin	18	None
7/10/2019	LCRA Dalchau Service Center, Austin	21	None
10/9/2019	LCRA Dalchau Service Center, Austin	12	None
11/13/2019	LCRA Dalchau Service Center, Austin	14	None
1/15/2020	LCRA Dalchau Service Center, Austin	17	None
2/5/2020	LCRA Redbud Center, Austin	TBD	None
2/18/2020	LCRA Redbud Center, Austin	TBD	TBD

In addition to the regular planning group meetings, the LCRWPG has several sub-committees. These committees meet throughout each planning cycle to discuss certain parts of the plan in more detail. This planning cycle, recommendations from the committees were presented to the full planning group at regular planning group meetings. Committee meetings were open to the public. Meeting minutes from the relevant committees have been included as appendices in various chapters in the plan. *Table 10.2* lists each committee, the number of times the committee met, and whether members of the public attended any of the meetings.

Table 10.2: LCRWPG Committees

Committee	Number of Meetings	Public Attendance
Population and Water Demand	6	Yes
Water Modeling	5	Yes
Nominations	4	No
Water Management Strategies	10	Yes
Policy/Legislative	5	Yes
Unique Stream Segments	1	No

10.3 PRESENTATION TO CIVIC AND SPECIAL-INTEREST GROUPS

Using their own materials, Planning Group members gave presentations to civic and special-interest groups. *Table 10.3* provides a summary of this outreach effort with a listing of the LCRWPG presentations to civic and special interest groups.

These presentations were made to groups composed of individuals from all types of general and special interests that were identified by the TWDB in the establishment of the RWPGs.

Table 10.3: LCRWPG Public Outreach: Presentations by RWPG Members to Other Groups

Presenter	Date	County	Community Group	Topic/Subject
Jim Brasher	Regularly, throughout planning process	Colorado	Colorado County Groundwater Conservation District	Update on Region K planning
John Burke	2016	Bexar	Region L	Rainwater Harvesting
David Lindsay, Steve Box	April 2019	Travis	Region K Water Management Strategies Committee	Watershed Issues and the Suggested Strategy to Protect Inflows to the Colorado River

10.4 REGION K ACTIVITIES

10.4.1 Advertising and Media

The LCRWPG advertised Region K regular and committee meetings through the Secretary of State website, the Region K website, and electronic mailouts to interested parties of meeting agendas and associated meeting materials.

10.4.2 Surveys

The Planning Group conducted three surveys to obtain feedback on population and water demand projections, on water supplies and water management strategies for the 2021 planning cycle, and on implementation of strategies recommended during the 2016 planning cycle. These letters and surveys are summarized below, and examples of the survey letters and types of responses are contained in *Appendix 10B.*

- The Regional Water Planning Population and Water Demand Projections survey was sent in February of 2017, to Water User Groups in the Region K area soliciting feedback on the draft population and water demand projections developed by TWDB. The TWDB required certain types of information be submitted as support for any proposed changes to their projections. Sixty-six (66) responses were received from the survey. The information received in the survey responses aided the Population and Water Demand Committee in developing its revision request to TWDB. See *Appendix 10B* for an example of the survey letter and accompanying materials. See *Appendix 2C* in *Chapter 2* for the documented population and water demand revision request submitted by the LCRWPG to TWDB.
- A survey to help identify the current water supplies and potentially feasible water management strategies was sent to Water User Groups in February of 2018. Sixty-four (64) responses were received. See *Appendix 10B* for an example of the correspondence and the survey. The information provided by the Water User Groups aided in the development of *Chapter 3* and *Chapter 5* of the 2021 Region K Water Plan.
- A survey requesting information related to implementation of water management strategies recommended in the 2016 Region K Water Plan was sent to Water User Groups (project sponsors) in November of 2019. The survey itself was developed from questions in a spreadsheet template provided by TWDB. Seventeen (17) recipients responded, and most responders were project sponsors for more than one project. See Appendix 10B for an example of the correspondence and the survey. The results of the survey are included in *Appendix 11A* in *Chapter 11*.

10.4.3 Public Meetings and Hearing

In addition to the meetings shown earlier in *Table 10.1*, an additional meeting was held for the primary purpose of gaining input and answering questions from the public on Region K's grant application for the 5th cycle of regional water planning. This meeting was held on April 13, 2016. The public input received was summarized in a table included in *Appendix 10A.*

The required public hearing for the Initially Prepared Plan is tentatively scheduled for April 22, 2020. Details related to the public hearing will be included as part of the final plan.

10.5 RELATED OUTREACH ACTIVITIES WITHIN THE REGION K AREA BEYOND THE LCRWPG

There are several studies, workgroups, and legislative committees whose findings may affect the way water needs are met, what the requirements will be, and other factors. The following related studies are activities within the Region K area beyond the LCRWPG.

10.5.1 LCRA Water Management Plan

During the majority of the current planning cycle, LCRA has operated the Lower Colorado River under provisions of the 2015 Water Management Plan (WMP). This plan was approved by Texas Commission on Environmental Quality (TCEQ) as a condition of the LCRA's water rights permits for lakes Buchanan and Travis, the two major water supply reservoirs in the Highland Lakes. An amendment to the plan was developed through a stakeholder process that began in 2018 and was approved by TCEQ in February 2020.

General information and a copy of the amendment can be found on the LCRA's website at www.lcra.org.

10.5.2 Environmental Flows Advisory Group

The 80th Texas Legislature established the Environmental Flows Advisory Group which is composed of nine members. This group is comprised of three Senate members, three House members and three public members. The public members are representatives of TCEQ, TWDB, and TPWD. This Advisory Group is tasked with balancing the demand placed on the State's water resources by the growing population and the requirements of the riverine, bay, and estuary systems. To assist them, the Advisory Group formed the Texas Environmental Flows Science Advisory Committee along with Basin and Bay Area Stakeholders Committees (BBASC). Additional committee information, updates and activities can be found at TCEQ's website at: https://www.tceq.texas.gov/permitting/water_rights/wr_technical-resources/eflows/colorado-lavaca-bbasc

In September 2009, the Texas Environmental Flows Advisory Group appointed members of the Colorado and Lavaca Rivers and Matagorda and Lavaca Bays BBASC. The committee made recommendations to the TCEQ on the quantity of water needed to maintain the health of the named rivers and bays. TCEQ adopted new environmental flow standards from the input they received from the Committee that became effective in August 2012.

During this planning cycle, the BBASC has met three times, once in 2017 and twice in 2019, to receive presentations on various studies being performed on the local rivers and bays.

10.5.3 Irrigation District Advisory Panel

There are advisory panels for each of the three irrigation divisions operated by LCRA: Garwood, Lakeside, and Gulf Coast. These groups are self-elected and are sponsored by LCRA. LCRA discusses with these groups anything related to LCRA's operations that is relevant to the customer groups. The discussions range from rate changes, changes in operations procedures, key projects impacting the irrigation districts, and other items that need to be communicated.

APPENDIX 10A

SUMMARY OF PUBLIC INPUT FROM MEETING HELD APRIL 13, 2016

Region K responsibility (Y1 - Y27):

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
Y1	Overall Planning Process	RWPG should adopt and apply a set of guiding principles to serve as a blueprint for long-term water sustainability	Hill Country Alliance	2016- 2017	Core principles maintain clarity of mission and inform the process.	Region K	Yes, Hill Country Alliance will draft and submit to Reg K for consideration
Y2	Overall Planning Process	Recommendations for future planning in Chapter 8 will be presented and reviewed in each appropriate chapter; Would like confirmation that IPP Review comments will be considered in 2021 Region K planning and assume they will be presented and reviewed in each appropriate chapter; Recommend all comments in the IPP list and Chapter 8 be combined into one list and organized by Chapter and Time order to create a review checklist for the RWPG	Donna Klaeger	2016-2020		Region K (Not a TWDB requirement, though)	Yes
Y3	Regional Planning Description	Add discussion to Chapter 1 of the climate-related differences, drivers and impacts across the Colorado River Basin within Region K, particularly the Balcones Escarpment where the Gulf Coastal Plains transition into the Texas Hill Country	David Lindsay; Central Texas Water Coalition	By end of 2019	Provides important context for influences on future water supplies and availability	Region K	Yes
Y4	Regional Planning Description	Chapter 1 does not provide a basin wide economic review. Recommend replacing Chapter 1 with a complete review of the Colorado River Basin economic status	Donna Klaeger	By end of 2019	Refer to Region F complete economic review by county of its region.	Region K	Yes, Region K will consider modifying current Chapter 1 section to include data similar to Region F plan.
Y5	Population and Demand Projections	Review methodology and assumptions behind generating agricultural irrigation demands	Central Texas Water Coalition/ Kevin Klein	Fall 2016 / Spring 2017	Use of three different irrigation demand data sets (1992-2011, 2000-2011 and 2009) is inconsistent, irrigated acres and water use/acre not considered in demand calculations, historical use numbers may not reflect accurately reflect future use	Region K	Yes

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
Y6	Population and Demand Projections	Believe the Domestic and Livestock demands are understated.	No Colorado River Dam	Fall 2016 / Spring 2017	Been told that D&L demand is determined by various indirect methods. Why not identify the number of D&L users, apply a reasonable projection of demand, and list it as a separate WUG in the projections? Currently these estimates are buried somewhere in Livestock and/or County-Other. Why not be clear about these needs?	Region K	Yes
Y7	Population and Demand Projections and Water Availability	Incorporate consideration of climate change and thus climate uncertainty into both our supply and demand planning.	City of Austin - Austin Water	2016-2018	Including discussion of these items early in the process could strengthen our approach to drought planning and overall preparedness for a range of climate conditions.	Region K	Yes, City of Austin Water Utility will share data
Y8	Water Availablity	Reassess firm yield calculations for Lakes Buchanan and Travis	Central Texas Water Coalition; Joe Don Dockery (Burnet County Commissioner)	By September 2018	LCRA will be operating under a new water management plan as of 2016, which will create the need to update firm supply as well as other aspects of the plan.	Region K	Yes
Y9	Water Availablity	Incorporate as much as possible extended hydrology for WAM modeling into our planning (including naturalized hydrology data for 2014 and beyond).	City of Austin - Austin Water	2017-2018	Including discussion of these items early in the process could strengthen our approach to drought planning and overall preparedness for a range of climate conditions.	Region K (if data is available)	Yes, if available
Y10	Water Management Strategies	The total volume of yield from recommended WMS should be similar to or equal to the volume needed to meet water shortages	Sierra Club/ NWF/ Environment Texas/ Hill Country Alliance	Spring-Fall 2018	RWPs are reworked every 5 yrs, amendment process is straightforward, alternate water strategy category already exists	Region K	Yes
Y11	Water Management Strategies	Adopt policy change to make conservation goals more aggressive for WUGS with GPCD between 140 and 200.	Sierra Club/ NWF/ Environment Texas/ Hill Country Alliance	Spring-Fall 2018	2012 Region K Plan had this stronger water conservation recommendation, 140 gpcd is attainable (ex. Austin)	Region K	Yes
Y12	Water Management Strategies	Include wider breadth of discussion regarding the neccessity of flood irrigation as the main irrigation method; Include additional WMS for agricultural irrigation as supported by research and application in other communities	Central Texas Water Coalition	By end of 2019	Alternatives to flood irrigation should be discussed as well as a wider breadth of management techniques to make flood irrigation more efficient. Innovative water management strategies for agricultural irrigation such as drip irrigation and use of brackish groundwater were not included in the 2016 Region K water plan	Region K	Yes
Y13	Water Management Strategies	Include more detailed discussion in Chapter 5 on feasiblity/legality of enhanced recharge water management strategy	Central Texas Water Coalition	By end of 2019	This is a complicated concept and should be vetted further.	Region K	Yes

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
Y14	Water Management Strategies	Revisit quantification of savings for on-farm sprinkler irrigation water management strategy and assumptions behind savings	LCRA	Fall 2018- Fall 2019	Based on a survey conducted for LCRA through UT, only 25% of Lakeside farmers flush as a standard practice before holding a permanent flood. Including artificially high savings for this strategy makes it seem more cost effective than most other strategies with that may not be the case.	Region K	Yes
Y15	Water Management Strategies	Work with NRCS to modify potential irrigated acreage where on-farm strategies can be adopted to include groundwater areas, not just LCRA's service areas	LCRA- new comment	Spring- Fall 2019	Current adoption rates are only based on LCRA's service area and are therefore under- estimated	Region K	Yes
Y16	Water Management Strategies	Revisit City of Wharton water supply strategy to adopt as a recommended or alternative strategy	City of Wharton	Spring-Fall 2018	This strategy was included in the 2016 Region K Plan as a considered but not recommended or alternative strategy due to the late timing of submittal to the RWPG and the lack of feasibility studies.	Region K	Yes
Y17	Water Management Strategies	Prioritize and encourage water neutral decentralized systems that capture, use and reuse water in place.	Hill Country Alliance	Spring-Fall 2018	19th Century transmission pipeline infrastructure systems encourage waste and the de- watering of one region at the expense of another.	Region K	Yes
Y18	Water Management Strategies	Promote dredging of the Highland Lakes by LCRA to increase the capacity of the lakes.	Joe Don Dockery (Burnet County Commissioner), Donna Klaeger	Spring- Fall 2019	By TWDB's estimation, the Highland Lakes have lost 155,000 to 175,000 acre/feet of permitted storage to siltation since their construction. Keeping in mind this lost storage is already permitted. It simply needs to be reclaimed.	Region K	Yes, will consider as a strategy
Y19	Water Management Strategies	Region K should establish rules that make it clear that if a water user proposes a project, it is the RWPG's responsibility to include the project in the plan subject to any concerns or issues raised by opponents of the project. The rules should clarify that Region K is not a regulatory agency and should not "decide" whether a project should be approved, but rather should evaluate and analyze those strategies put forward.	City of Goldthwaite	Spring-Fall 2018	The City of Goldthwaite's in-channel dam project was removed from the 2016 Plan as a recommended strategy.	Region K	N/A; projects that provide no water supply during a drought of record do not meet TWDB guidelines for inclusion in regional water planning

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
Y20	Water Management Strategies	Concern regarding Hays County Pipeline project	Barbara Hopson, Wimberley resident	Spring- Fall 2019	According to the State Plan's own reckoning, the Wimberley area will not need additional water until 2040 at the earliest, although the Dripping Springs area needs additional water immediately because the City of Dripping Springs continues to approve plats for enormous subdivisions for which there is insufficient water available.	Region K	Yes
Y21	Water Management Strategies	Consider more rainwater harvesting as a strategy for the Region	TBD	Spring- Fall 2019		Region K	Yes
Y22	Water Management Strategies and Policy Recommendations	Policy recommendation for each WUG to consider alternative supplies such as reuse and rainwater in addition to water conservation before adopting large infrastructure projects to import water long distances	Hill Country Alliance	Spring-Fall 2018	Conservation and re- use are more economical than building large infrastructure at public expense so that a few user groups can consume large amounts of water on discretionary uses.	Region K	Yes, but not as a policy
Y23	Water Management Strategies (Environmental Impacts)	Evaluate cumulative impacts of new WMS on instream flows	Sierra Club/ NWF	Spring- Fall 2019	multiple new downstream surface storage, direct/indirect reuse and full use of water rights can have cumulative impacts on instream flows	Region K	Yes
Y24	Water Management Strategies (Ch 5) and Implementation (Ch 11)	Apply quantifiable targets and metrics for water conservation to all water user groups, not just municipal	Central Texas Water Coalition/ Kevin Klein; Donna Klaeger	Spring-Fall 2018	Consistency is needed across water user groups to quantify conservation goals and track progress toward goals	Region K	Yes, if data is available
Y25	Policy Recommendation	Request the RWPG discuss a request to study to understand the hydrology for low inflows and a study to provide a current firm yield from the Highland Lakes, so that we are dealing with verified yields in this plan	Donna Klaeger	2016-2017		Region K	Yes
Y26	Consultant Procurement	Recommends Region K use an RFQ process to select a consultant.	Jordan Furnans, LRE Water LLC	Fall 2020 - Spring 2021	n/a	Region K	N/A
Y27	Water Supply and Water Management Strategies	Describe process to determine environmental water needs and results/recommendations (SB3 process)	Sierra Club/ NWF	2019	Region K acknowledges that environmental water needs are important and should be included in the plan, but it is not in our purview to recommend strategies to meet those needs at this time.	Region K	Yes

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

Not Region K responsibility, but Region K may consider (M1 - M13):

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
M1	Overall Planning Process	Strengthen collaborations with allies, state agencies, universities, and other planning groups	No Colorado River Dam	2016-2020	There are many ways that allies in the region, including state agencies and universities, as well as other planning groups, can come together to identify ways to improve the vitality of the river. Particular concern about the health of the river near The Biological Field Station at the Timberlake Ranch and Colorado Bend State Park.	Not Region K responsibility, but individual members can act if they so choose	Potentially, using no TWDB funds. Educational field trip may be an idea for Region K members
M2	Regional Planning Description and Water Management Strategies	Address distribution and conveyance system water loss for agricultural irrigation water users	Central Texas Water Coalition	Spring- Fall 2019	Water loss is addressed for municipal water user groups in Chapter and therefore should be addressed for agricultural water user groups as well.	TWDB	Region K will request data, if available
M3	Population and Demand Projections	Revision of population and water demand estimates should go through a formal public comment process	Hill Country Alliance	Fall 2016 / Spring 2017	This will make the revision process more transparent	TWDB (process already in place)	Yes
M4	Water Availablity	Assumptions used in Water Availability models regarding demand seem unreasonable.	No Colorado River Dam	By September 2018	Under DOR conditions, it seems impossible that 100% of authorized demand would be available to all permit holders. Those who live on the Colorado River realize that the river can't deliver 100% of demand under what has become "new normal" conditions. Why not statistically validate the model using past projections with documented actuals? If we can get the assumptions and the models right, we'll be able to make wiser decisions.	TWDB / TCEQ	Region K will look at as part of modeling assumptions
M5	Water Management Strategies	Address how to include distribution- side extensions of reuse projects as viable recommended water management strategies that have associated project costs	LCRA -new comment	2016-2017	There are several municipalities around the highland lakes that have active reuse programs that do not have associated costs in the 2016 regional water plan due to lack of information or that they are extensions of existing reuse lines. This is an important strategy that needs to be included as a viable WMS in the water planning process	TWDB	Will look for guidance from TWDB; may be considered as a Chapter 8 recommendation
M6	Water Management Strategies/ Conservation and Policy Recommendations	Encourage WUGs within Region K to develop more uniform conservation oriented management plans	Hill Country Alliance	Spring- Fall 2019	Conservation and re- use are more economical than building large infrastructure at public expense so that a few user groups can consume large amounts of water on discretionary uses.	TCEQ	Hill Country Alliance can provide information for Region K to consider

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
M7	Drought Response (Chapter 7)	Include information pertaining to extended drought-related climatology cycles and historical extended drought cycles that have been more severe than the Drought of Record, should be incorporated in this planning cycle	David Lindsay	By March 2020	This information could provide valuable insights and context to consider regarding the question of whether our current water planning processes are sufficiently responsive and protective	N/A	If data is available
M8	Policy Recommendation	Authorize study on the relationship between groundwater level elevations and spring-flow rates in hill country rivers	Hill Country Alliance	2016-2017	The relationship between groundwater level elevations and spring-flow rates in most hill country rivers is poorly understood. Few monitoring wells exist that can provide continuous water level readings and this data has not been compared to spring flows	N/A	If data is available
M9	Policy Recommendation	Advocate to lift the discharge ban for the Highland Lakes	Joe Don Dockery (Burnet County Commissioner), Donna Klaeger	By March 2020	The currently available wastewater treatments can equal or surpass the water quality levels of naturally occurring water sources and should be included in returns to the water storage facilities.	Individual stakeholders; Region K (Chapter 8 policy recommendation only)	Yes, consider as part of Chapter 8
M10	Policy Recommendation	Request TCEQ to expand the permitted uses of "purple pipe" (treated effluent) water by municipalities to relieve the pressure on our existing raw water sources.	Joe Don Dockery (Burnet County Commissioner)	By March 2020	n/a	Individual stakeholders; Region K (Chapter 8 policy recommendation only)	Yes, consider as part of Chapter 8
M11	Policy Recommendation	Ask LCRA to reexamine the impacts of the Non-point Source Pollution Ordinance on inflows to the water storage system.	Joe Don Dockery (Burnet County Commissioner)	By March 2020	The Highland Lakes Watershed Ordinance is too aggressive in its capture of runoff from impervious cover construction, therefore withholding inflows. The requirements are also an impediment to new commercial growth in the Highland Lakes area from an added cost of construction aspect.	Individual stakeholders; Region K (Chapter 8 policy recommendation only)	Yes, consider as part of Chapter 8
M12	Unique Stream Segments	Region K recommend designation of the ten streams identified as warranting further study for consideration as unique stream segments be designated by the 2017 Legislature	Hill Country Alliance	2016 to be addressed in 2017 session	Increases visibility, ecological and economic value of particular stream segnments	State Legislature	Include the same ten in Chapter 8 as previous plans
M13	Overall Planning Process	Focus on the health of the river	No Colorado River Dam	2016-2020	Because the Colorado River is the lifeblood of Region K, we suggest the RWPG start with an intensely fresh focus on the health of the river and the controllable conditions in the river basin that affect water quality and availability.	TCEQ / State Legislature	Region K considers environmental flow and water quality issues as part of the strategy evaluation process

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

Not Region K responsibility, and Region K will not consider (N1 - N7):

#	RWP Task	Topic	Organization	RWP Timeframe	Supporting arguments	Responsibility	Will Region K Consider for 2021 RWP Inclusion?
N1	Population and Demand Projections	Include environmental water needs as water user groups	Sierra Club/ NWF/ Environment Texas/ Central Texas Water Coalition	2016	Formalizing a process to include environmental water needs as a water user group will ensure that water needs for instream flows are accounted for just like any other water user category	State Legislature / TWDB	No, refer to Y27 for additional information related to environmental water needs
N2	Population and Demand Projections	Include the protection of recreational use as a formal category of use to be planned for	Central Texas Water Coalition	2016		State Legislature / TWDB	No, but the plan will continue to include discussion related to recreation and its importance to the Region
N3	Water Management Strategies	Include water pricing as a water management strategy for all water user groups	Central Texas Water Coalition / Frank Cooley; Donna Klaeger	Spring-Fall 2018	Tiered pricing is a proven, cost-effective water management strategy	Water wholesalers and retailers	No, however Region K could consider including a Chapter 8 recommendation regarding water pricing
N4	Water Management Strategies	Implore LCRA to increase the "full" lake level of Lake Buchanan from 1018 msl to 1020 msl.	Joe Don Dockery (Burnet County Commissioner), Donna Klaeger	Spring- Fall 2019	This additional storage capacity would equate to approximately 45,000 acre/feet of increased raw water, or 5,000 acre/feet more than the LCRA Lane City reservoir currently under construction. With the addition of lifts at each individual gate on Buchanan Dam and the installation of the Hydromet warning system, this can be a reality in the very near future.	LCRA	No
N5	Drought Response (Chapter 7)	Include a more comprehensive drought plan for LCRA's irrigation districts	Central Texas Water Coalition	By March 2020	Drought planning should be addressed equally across all water user groups	LCRA	Refer to LCRA
N6	Policy Recommendation	Clarify TCEQ Rule TAC 295.16 so that TCEQ would have a defensible basis to cease processing an application which was specifically omitted from the Water Plan.	No Colorado River Dam	2016	Region K did not include the Goldthwaite In-Channel Dam project as a recommended strategy in the 2016 RWP, but proponents continue to suggest the dam is justified and TCEQ spends public resources to process the permit application.	TCEQ	No
N7	Unique Stream Segments	Add additional unique stream segments to the Region K list for cycle 5	Hill Country Alliance	By March 2020	Increases visibility, ecological and economic value of particular stream segnments	State Legislature	No

Region K responsibility (Y1 - Y27)
Not Region K responsibility, but Region K may consider (M1 - M13)
Not Region K responsibility and Region K will not consider (N1 - N7)
Consideration does not guarantee inclusion.

APPENDIX 10B

1. REGION K POPULATION AND WATER DEMAND PROJECTIONS SURVEY

2. REGION K WATER SUPPLY AND STRATEGY SURVEY

3. REGION K IMPLEMENTATION SURVEY

AECOM

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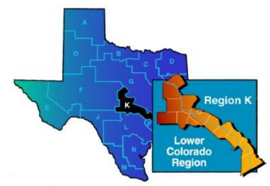
February 15, 2017



Subject: Lower Colorado Regional Water Planning Area (Region K)
Draft Projected Population and Water Demands for 2021 Regional Water Plan
Please Review and Respond

Dear Water User Group Representative:

The Texas Water Development Board (TWDB) has developed and released for review the **draft population and municipal water demand projections** intended for use in developing the 2021 Region K Water Plan. The Lower Colorado Regional Water Planning Group (Region K) is currently reviewing the draft projections for the region and is **seeking input from local utilities** to either verify the projections appear accurate or request that the TWDB consider revising the numbers.

As part of the 2021 Regional Water Plan, the consultant team is currently performing tasks related to the allocation of water supply and demand for Water User Groups (WUGs) in our region to determine projected future water shortages. A WUG consists of a demand center to which water resources can be allocated. Municipal WUGs are associated with populations within and outside of water utility service areas, and the projections of these populations are used to estimate future water demands. This utility-based planning method is slightly different from previous planning cycles, where city limits were also used to determine population areas. As a result, please note that the draft population and municipal demand projections provided by TWDB in the attached table should represent your entire water utility service area. For city water utilities, this may be less than or greater than the population within the city limits.

The draft population projections that have been provided by the TWDB for the 2021 Region K Water Plan use the 2010 Census data as a base, which the State Demographer and TWDB staff have projected out into the future. The associated municipal water demand projections rely on per capita water use as reported in the 2011 Water Use Survey to the TWDB, which have then been projected out to 2070. Addiitionally, the per capita water use values have been modified for anticipated plumbing code efficiency savings, which can explain why water demands might decrease over time.

The attached table lists all of the municipal WUGs located within Region K in alphabetical order. Rural areas that did not meet the criteria for being defined as an individual WUG are listed as “County-Other” in the table. If a WUG is located in more than one county and/or region, each of the county/region components and a summed total are shown to provide the entire picture.

We are asking that you review the population and demand projections for your WUG and respond with either:

- The numbers represent reasonable projections and require no revision, or

- You would like to revise your projections and *can provide information to support your request*.

If **no revisions** are requested, a quick call or email to let us know you've reviewed the numbers and have no changes would be very appreciated. My contact information is at the end of this letter.

If you believe adjustments to the population and/or water demand projections may be warranted, please contact me so we can disuss your entity and what documentation might be needed by TWDB to back up a modification. Please contact me at your earliest convenience, preferably no later than **May 1, 2017**.

In addition, if after reviewing the water demand numbers, you have concerns regarding whether your current water supplies are able to meet your future water demands, Region K would be very glad to talk with you about what types of water management strategies would be appropriate to recommend for your WUG in the 2021 Region K Water Plan. Having a strategy or project recommended in a Region Water Plan can help in the process of applying for certain types of State funding.

You may contact me with any additional questions you have regarding the draft projections or regional water planning. I may be reached directly at (512) 457-7798 or at jaime.burke@aecom.com. For additional information, please also visit Region K's website at www.regionk.org and the TWDB's regional water planning webpage http://www.twdb.texas.gov/waterplanning/rwp/index.asp.

Thank you for taking the time to help support the regional water planning process in Texas.

Sincerely,

Jaime J Burke

Jaime Burke, P.E.
Project Manager
AECOM
Consultant for the Lower Colorado Regional Water Planning Group (Region K)
Direct 512-457-7798
jaime.burke@aecom.com

Enclosure – Table containing TWDB draft projections for all municipal WUGs in Region K

Copy: File

1 MGD = 1,120 ac-ft/yr
1 ac-ft = 325,851 gallons
GPCD = gallons per capita daily

				TWDB Draft Projections for 2022 State Water Plan												
RWP Utility ID	Region	County	Water User Group (WUG) Name	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070	Base GPCD	Municipal Demands 2020 (Ac-Ft/Yr)	Municipal Demands 2030 (Ac-Ft/Yr)	Municipal Demands 2040 (Ac-Ft/Yr)	Municipal Demands 2050 (Ac-Ft/Yr)	Municipal Demands 2060 (Ac-Ft/Yr)	Municipal Demands 2070 (Ac-Ft/Yr)
87	K	BASTROP	AQUA WSC	56,184	73,878	96,878	128,039	170,128	226,087	156	9,226	11,834	15,310	20,112	26,678	35,425
87	K	FAYETTE	AQUA WSC	24	27	30	31	33	34	156	4	4	5	5	5	5
87	K	TRAVIS	AQUA WSC	6,627	7,652	8,618	9,700	10,656	11,544	156	1,088	1,226	1,362	1,524	1,671	1,809
87	G	LEE	AQUA WSC	2,832	3,184	3,386	3,460	3,509	3,536	156	465	510	535	543	550	554
87	L	CALDWELL	AQUA WSC	1,730	2,118	2,501	2,879	3,261	3,633	156	284	339	395	452	511	569
			AQUA WSC TOTAL	67,397	86,859	111,413	144,109	187,587	244,834	156	11,067	13,913	17,607	22,636	29,415	38,362
115	K	HAYS	AUSTIN	74	796	1,560	3,957	9,535	17,255	157	13	133	260	660	1,591	2,880
115	K	TRAVIS	AUSTIN	960,709	1,125,478	1,285,243	1,402,811	1,496,994	1,607,291	157	162,496	187,844	214,509	234,131	249,850	268,259
115	K	WILLIAMSON	AUSTIN	47,680	59,897	74,334	89,882	107,514	126,860	157	8,065	9,997	12,406	15,001	17,944	21,173
			AUSTIN TOTAL	1,008,463	1,186,171	1,361,137	1,496,650	1,614,043	1,751,406	157	170,574	197,974	227,175	249,792	269,385	292,312
154	K	TRAVIS	BARTON CREEK WEST WSC	1,337	1,337	1,337	1,337	1,337	1,337	272	396	392	389	388	387	387
155	K	TRAVIS	BARTON CREEK WSC	702	832	956	1,047	1,121	1,206	649	504	594	681	745	798	858
158	K	BASTROP	BASTROP	11,069	15,008	20,129	27,068	36,439	48,898	191	2,244	2,978	3,951	5,288	7,111	9,536
161	K	BASTROP	BASTROP COUNTY WCID 2	5,007	7,450	10,626	14,930	20,741	28,469	94	479	690	971	1,357	1,882	2,580
165	K	MATAGORDA	BAY CITY	19,285	20,300	20,950	21,453	21,810	22,066	145	2,916	2,969	2,985	3,031	3,074	3,110
208	K	BURNET	BERTRAM	1,764	2,134	2,445	2,745	3,007	3,235	227	430	511	581	649	710	764
235	K	BLANCO	BLANCO	2,156	2,563	2,802	2,927	3,010	3,061	161	365	423	456	472	485	493
268	K	WHARTON	BOLING MWD	855	910	954	992	1,027	1,058	119	105	107	109	112	115	119
308	K	TRAVIS	BRIARCLIFF	2,009	2,320	2,613	2,942	3,231	3,500	141	300	340	380	425	466	504
320	K	MILLS	BROOKESMITH SUD	48	50	51	53	55	57	142	7	7	7	7	8	8
320	F	BROWN	BROOKESMITH SUD	8,047	8,240	8,241	8,240	8,240	8,241	142	1,199	1,195	1,170	1,156	1,153	1,153
320	F	COLEMAN	BROOKESMITH SUD	41	42	42	42	42	42	142	6	6	6	6	6	6
			BROOKESMITH SUD TOTAL	8,136	8,332	8,334	8,335	8,337	8,340	426	1,212	1,208	1,183	1,169	1,167	1,167
340	K	HAYS	BUDA	9,831	14,132	19,369	25,916	33,315	41,735	168	1,768	2,508	3,419	4,563	5,860	7,338
340	L	HAYS	BUDA	1,658	2,184	2,826	3,627	4,533	5,564	168	298	388	499	639	797	978
			BUDA TOTAL	11,489	16,316	22,195	29,543	37,848	47,299	168	2,066	2,896	3,918	5,202	6,657	8,316
354	K	BURNET	BURNET	7,424	8,983	10,298	11,555	12,660	13,619	231	1,844	2,197	2,497	2,790	3,054	3,284
392	K	MATAGORDA	CANEY CREEK MUD OF MATAGORDA COUNTY	2,088	2,198	2,270	2,324	2,362	2,390	118	252	255	255	258	261	264
398	K	BLANCO	CANYON LAKE WATER SERVICE	665	933	1,204	1,478	1,749	2,011	119	83	115	147	180	213	245
398	L	COMAL	CANYON LAKE WATER SERVICE	37,856	53,126	68,559	84,107	99,577	114,491	119	4,742	6,540	8,388	10,258	12,127	13,934
			CANYON LAKE WATER SERVICE TOTAL	38,521	54,059	69,763	85,585	101,326	116,502	119	4,825	6,655	8,535	10,438	12,340	14,179
436	K	TRAVIS	CEDAR PARK	10,913	11,641	12,521	12,521	12,521	12,521	193	2,251	2,387	2,554	2,550	2,547	2,546
436	G	WILLIAMSON	CEDAR PARK	81,716	90,641	90,641	90,641	90,641	90,641	193	16,857	18,582	18,490	18,457	18,441	18,434
			CEDAR PARK TOTAL	92,629	102,282	103,162	103,162	103,162	103,162	193	19,108	20,969	21,044	21,007	20,988	20,980
486	K	BURNET	CHISHOLM TRAIL SUD	379	460	527	591	647	696	174	70	84	96	107	117	126
486	G	BELL	CHISHOLM TRAIL SUD	2,967	3,488	4,027	4,562	5,086	5,602	174	551	640	734	829	923	1,016
486	G	WILLIAMSON	CHISHOLM TRAIL SUD	24,194	30,392	38,113	46,427	55,854	65,602	174	4,496	5,575	6,948	8,438	10,138	11,901
			CHISHOLM TRAIL SUD TOTAL	27,540	34,340	42,667	51,580	61,587	71,900	174	5,117	6,299	7,778	9,374	11,178	13,043
494	K	HAYS	CIMARRON PARK WATER	2,115	2,115	2,115	2,115	2,115	2,115	112	244	236	230	226	225	225
531	K	COLORADO	COLUMBUS	3,832	3,999	4,123	4,305	4,457	4,605	274	1,134	1,164	1,185	1,229	1,271	1,313

1. List presented alphabetically by Water User Group (WUG) Name (4th column)
2. Utilities in more than one county and/or region are shown so and have been totaled.
   All others occupy a single line.

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				TWDB Draft Projections for 2022 State Water Plan												
RWP Utility ID	Region	County	Water User Group (WUG) Name	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070	Base GPCD	Municipal Demands 2020 (Ac-Ft/Yr)	Municipal Demands 2030 (Ac-Ft/Yr)	Municipal Demands 2040 (Ac-Ft/Yr)	Municipal Demands 2050 (Ac-Ft/Yr)	Municipal Demands 2060 (Ac-Ft/Yr)	Municipal Demands 2070 (Ac-Ft/Yr)
570	K	BURNET	CORIX UTILITIES TEXAS INC	809	979	1,122	1,259	1,379	1,484	149	126	149	168	187	204	220
570	K	COLORADO	CORIX UTILITIES TEXAS INC	275	287	296	309	320	331	149	43	44	44	46	47	49
570	K	LLANO	CORIX UTILITIES TEXAS INC	1,199	1,211	1,223	1,235	1,248	1,260	149	187	184	183	184	185	187
570	K	MATAGORDA	CORIX UTILITIES TEXAS INC	43	46	47	48	49	50	149	7	7	7	7	7	7
570	K	MILLS	CORIX UTILITIES TEXAS INC	74	76	78	81	84	87	149	12	12	12	12	12	13
570	K	SAN SABA	CORIX UTILITIES TEXAS INC	94	99	100	98	100	103	149	15	15	15	15	15	15
570	G	LAMPASAS	CORIX UTILITIES TEXAS INC	2,226	2,280	2,417	2,562	2,664	2,770	149	348	347	362	381	395	411
570	G	WASHINGTON	CORIX UTILITIES TEXAS INC	3,690	3,926	4,087	4,247	4,372	4,473	149	577	598	612	631	648	663
			CORIX UTILITIES TEXAS INC TOTAL	8,410	8,904	9,370	9,839	10,216	10,558	149	1,315	1,356	1,403	1,463	1,513	1,565
579	K	TRAVIS	COTTONWOOD CREEK MUD 1	1,447	1,715	1,970	2,158	2,312	2,485	80	116	133	149	161	172	184
580	K	BURNET	COTTONWOOD SHORES	1,395	1,688	1,935	2,171	2,379	2,559	154	227	268	304	339	371	398
	K	BASTROP	COUNTY-OTHER, BASTROP	7,794	9,006	10,575	12,706	15,585	19,413	170	1,418	1,616	1,884	2,255	2,761	3,437
	K	BLANCO	COUNTY-OTHER, BLANCO	8,141	9,538	10,243	10,480	10,549	10,486	120	1,008	1,143	1,205	1,222	1,227	1,219
	K	BURNET	COUNTY-OTHER, BURNET	20,892	22,826	22,151	24,000	26,259	28,955	146	3,207	3,424	3,272	3,520	3,842	4,234
	K	COLORADO	COUNTY-OTHER, COLORADO	11,810	12,325	12,705	13,267	13,735	14,189	119	1,453	1,463	1,467	1,508	1,557	1,607
	K	FAYETTE	COUNTY-OTHER, FAYETTE	9,589	10,943	11,825	12,511	13,015	13,353	112	1,095	1,198	1,259	1,313	1,362	1,397
	K	GILLESPIE	COUNTY-OTHER, GILLESPIE	14,739	15,914	16,882	18,017	19,061	20,075	114	1,735	1,808	1,869	1,967	2,075	2,184
	K	HAYS	COUNTY-OTHER, HAYS	17,821	22,702	28,847	35,419	39,663	43,122	118	2,192	2,720	3,390	4,134	4,617	5,016
	L	HAYS	COUNTY-OTHER, HAYS	16,539	18,505	34,878	46,005	89,408	137,563	118	2,035	2,217	4,098	5,370	10,409	16,001
			COUNTY-OTHER, HAYS TOTAL	34,360	41,207	63,725	81,424	129,071	180,685	118	4,227	4,937	7,488	9,504	15,026	21,017
	K	LLANO	COUNTY-OTHER, LLANO	2,455	1,926	2,053	2,085	1,932	1,810	103	260	202	215	217	200	187
	K	MATAGORDA	COUNTY-OTHER, MATAGORDA	9,928	10,447	10,782	11,042	11,227	11,357	103	1,036	1,040	1,034	1,038	1,052	1,064
	K	MILLS	COUNTY-OTHER, MILLS	2,676	2,766	2,839	2,951	3,064	3,193	124	343	341	338	348	360	375
	K	SAN SABA	COUNTY-OTHER, SAN SABA	1,403	1,468	1,480	1,455	1,487	1,523	149	218	220	217	213	217	222
	K	TRAVIS	COUNTY-OTHER, TRAVIS	14,744	13,073	11,999	8,903	6,411	7,067	136	2,067	1,818	1,663	1,229	879	967
	K	WHARTON	COUNTY-OTHER, WHARTON	14,640	15,577	16,329	16,979	17,580	18,111	126	1,898	1,936	1,972	2,044	2,111	2,173
	P	WHARTON	COUNTY-OTHER, WHARTON	3,448	3,880	4,226	4,525	4,800	5,046	126	447	482	510	545	576	606
			COUNTY-OTHER, WHARTON TOTAL	18,088	19,457	20,555	21,504	22,380	23,157	126	2,345	2,418	2,482	2,589	2,687	2,779
	K	WILLIAMSON	COUNTY-OTHER, WILLIAMSON	14,483	20,375	19,717	19,007	18,203	17,320	148	2,248	3,089	2,958	2,838	2,712	2,579
	G	WILLIAMSON	COUNTY-OTHER, WILLIAMSON	28,684	37,315	52,198	44,899	69,190	91,040	148	4,452	5,657	7,831	6,705	10,310	13,555
			COUNTY-OTHER, WILLIAMSON TOTAL	43,167	57,690	71,915	63,906	87,393	108,360	148	6,700	8,746	10,789	9,543	13,022	16,134
605	K	BASTROP	CREEDMOOR-MAHA WSC	22	25	29	33	37	40	110	2	3	3	3	4	4
605	K	TRAVIS	CREEDMOOR-MAHA WSC	5,777	6,641	7,456	8,368	9,178	9,934	110	641	704	767	848	928	1,004
605	L	CALDWELL	CREEDMOOR-MAHA WSC	1,642	1,919	2,191	2,487	2,771	3,052	110	182	203	225	252	280	308
605	L	HAYS	CREEDMOOR-MAHA WSC	64	75	85	97	108	119	110	7	8	9	10	11	12
			CREEDMOOR-MAHA WSC TOTAL	7,505	8,660	9,761	10,985	12,094	13,145	110	832	918	1,004	1,113	1,223	1,328
650	K	TRAVIS	CYPRESS RANCH WCID 1	1,233	1,416	1,551	1,661	1,786	1,786	96	121	134	144	153	164	163
690	K	HAYS	DEER CREEK RANCH WATER	331	392	451	494	529	569	78	26	29	33	35	38	41
690	K	TRAVIS	DEER CREEK RANCH WATER	556	659	757	829	888	954	78	43	49	55	59	63	68
			DEER CREEK RANCH WATER TOTAL	887	1,051	1,208	1,323	1,417	1,523	78	69	78	88	94	101	109
752	K	HAYS	DRIPPING SPRINGS WSC	5,165	6,368	7,833	9,666	11,736	14,092	165	906	1,098	1,339	1,646	1,995	2,394
764	K	COLORADO	EAGLE LAKE	3,803	3,968	4,091	4,270	4,421	4,568	132	521	525	526	540	558	576

1. List presented alphabetically by Water User Group (WUG) Name (4th column)
2. Utilities in more than one county and/or region are shown so and have been totaled.
All others occupy a single line.

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				TWDB Draft Projections for 2022 State Water Plan													
RWP Utility ID	Region	County	Water User Group (WUG) Name	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070	Base GPCD	Municipal Demands 2020 (Ac-Ft/Yr)	Municipal Demands 2030 (Ac-Ft/Yr)	Municipal Demands 2040 (Ac-Ft/Yr)	Municipal Demands 2050 (Ac-Ft/Yr)	Municipal Demands 2060 (Ac-Ft/Yr)	Municipal Demands 2070 (Ac-Ft/Yr)
806	K	WHARTON	EL CAMPO	27	29	30	31	32	33	178	5	5	5	6	6	6
806	P	WHARTON	EL CAMPO	12,096	12,660	13,111	13,502	13,863	14,183	178	2,286	2,334	2,371	2,417	2,476	2,533
			EL CAMPO TOTAL	12,123	12,689	13,141	13,533	13,895	14,216	178	2,291	2,339	2,376	2,423	2,482	2,539
820	K	BASTROP	ELGIN	9,380	12,273	16,034	21,128	28,009	37,158	135	1,317	1,674	2,155	2,822	3,734	4,950
820	K	TRAVIS	ELGIN	1,814	2,615	3,371	4,217	4,963	5,658	135	255	357	453	563	662	754
			ELGIN TOTAL	11,194	14,888	19,405	25,345	32,972	42,816	135	1,572	2,031	2,608	3,385	4,396	5,704
876	K	FAYETTE	FAYETTE COUNTY WCID MONUMENT HILL	703	803	870	926	970	1,003	144	106	118	126	133	139	143
877	K	FAYETTE	FAYETTE WSC	5,142	5,869	6,363	6,770	7,089	7,336	119	636	705	750	791	826	854
894	K	FAYETTE	FLATONIA	1,658	1,893	2,052	2,183	2,287	2,365	197	346	386	412	435	455	470
975	K	GILLESPIE	FREDERICKSBURG	12,056	12,938	13,666	14,519	15,304	16,067	257	3,351	3,543	3,703	3,911	4,118	4,322
1015	K	TRAVIS	GARFIELD WSC	1,772	2,100	2,412	2,641	2,830	3,042	109	199	230	259	281	301	323
1043	K	HAYS	GOFORTH SUD	1,366	1,801	2,329	2,985	3,724	4,564	105	147	188	239	304	378	463
1043	K	TRAVIS	GOFORTH SUD	87	115	148	190	237	291	105	9	12	15	19	24	30
1043	L	CALDWELL	GOFORTH SUD	601	793	1,025	1,314	1,640	2,010	105	65	83	105	134	167	204
1043	L	HAYS	GOFORTH SUD	15,218	20,068	25,943	33,251	41,492	50,849	105	1,636	2,090	2,660	3,385	4,215	5,160
			GOFORTH SUD TOTAL	17,272	22,777	29,445	37,740	47,093	57,714	105	1,857	2,373	3,019	3,842	4,784	5,857
1048	K	MILLS	GOLDTHWAITE	2,075	2,144	2,203	2,289	2,377	2,475	181	400	403	406	418	433	451
1075	K	BURNET	GRANITE SHOALS	6,751	8,168	9,363	10,506	11,512	12,383	103	722	850	960	1,069	1,169	1,256
1211	K	HAYS	HAYS	1,222	1,606	2,038	2,429	3,036	3,727	143	183	235	294	348	435	533
1212	K	HAYS	HAYS COUNTY WCID 1	3,647	3,647	3,647	3,647	3,647	3,647	210	821	808	801	798	797	797
1213	K	HAYS	HAYS COUNTY WCID 2	1,224	1,608	2,041	2,433	3,041	3,732	217	285	369	464	551	688	844
1289	K	TRAVIS	HORNSBY BEND UTILITY	7,066	8,372	9,616	10,531	11,282	12,130	83	594	678	761	823	879	944
1497	K	BURNET	HORSESHOE BAY	1,192	1,683	2,097	2,493	2,841	3,142	569	747	1,048	1,302	1,545	1,759	1,945
1497	K	LLANO	HORSESHOE BAY	4,933	5,117	4,989	5,058	4,984	4,872	569	3,091	3,187	3,097	3,134	3,086	3,017
			HORSESHOE BAY TOTAL	6,125	6,800	7,086	7,551	7,825	8,014	569	3,838	4,235	4,399	4,679	4,845	4,962
1315	K	TRAVIS	HURST CREEK MUD	3,095	3,095	3,095	3,095	3,095	3,095	447	1,520	1,511	1,505	1,502	1,501	1,501
1371	K	BLANCO	JOHNSON CITY	2,053	2,441	2,668	2,787	2,867	2,914	163	353	411	443	460	473	480
1382	K	TRAVIS	JONESTOWN WSC	3,948	4,222	4,481	4,768	5,022	5,259	138	574	601	629	665	699	732
1407	K	TRAVIS	KELLY LANE WCID 1	1,693	1,693	1,693	1,693	1,693	1,693	178	322	317	313	312	311	311
1410	K	BURNET	KEMPNER WSC	759	852	937	1,019	1,097	1,171	164	132	146	158	171	184	196
1410	G	BELL	KEMPNER WSC	2,004	2,166	2,393	2,603	2,803	2,991	164	332	371	405	437	470	501
1410	G	CORYELL	KEMPNER WSC	3,542	3,978	4,371	4,755	5,120	5,463	164	618	681	739	799	858	916
1410	G	LAMPASAS	KEMPNER WSC	9,563	10,572	11,350	12,146	12,851	13,485	164	1,669	1,809	1,919	2,040	2,155	2,260
			KEMPNER WSC TOTAL	15,868	17,568	19,051	20,523	21,871	23,110	164	2,751	3,007	3,221	3,447	3,667	3,873
1440	K	BURNET	KINGSLAND WSC	425	515	590	662	726	781	106	46	55	62	69	75	81
1440	K	LLANO	KINGSLAND WSC	8,419	9,716	9,680	9,247	10,078	10,938	106	918	1,032	1,015	962	1,045	1,133
			KINGSLAND WSC TOTAL	8,844	10,231	10,270	9,909	10,804	11,719	106	964	1,087	1,077	1,031	1,120	1,214
1469	K	FAYETTE	LA GRANGE	5,478	6,253	6,778	7,212	7,552	7,816	154	883	979	1,041	1,097	1,147	1,187
1484	K	TRAVIS	LAGO VISTA	7,580	8,964	10,269	11,730	13,020	14,220	228	1,868	2,184	2,487	2,832	3,140	3,428
1528	K	TRAVIS	LAKEWAY MUD	13,904	18,295	18,295	18,295	18,295	18,295	301	4,561	5,943	5,909	5,893	5,888	5,886
1557	K	TRAVIS	LEANDER	9,491	24,827	43,093	46,640	48,403	50,610	114	1,133	2,907	5,020	5,422	5,623	5,877
1557	G	WILLIAMSON	LEANDER	41,071	69,551	115,635	188,502	238,648	293,630	114	4,904	8,144	13,470	21,913	27,724	34,098
			LEANDER TOTAL	50,562	94,378	158,728	235,142	287,051	344,240	114	6,037	11,051	18,490	27,335	33,347	39,975

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				TWDB Draft Projections for 2022 State Water Plan													
RWP Utility ID	Region	County	Water User Group (WUG) Name	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070	Base GPCD	Municipal Demands 2020 (Ac-Ft/Yr)	Municipal Demands 2030 (Ac-Ft/Yr)	Municipal Demands 2040 (Ac-Ft/Yr)	Municipal Demands 2050 (Ac-Ft/Yr)	Municipal Demands 2060 (Ac-Ft/Yr)	Municipal Demands 2070 (Ac-Ft/Yr)
1561	K	BASTROP	LEE COUNTY WSC	998	1,311	1,719	2,273	3,021	4,015	122	127	161	208	272	361	479
1561	K	FAYETTE	LEE COUNTY WSC	1,435	1,638	1,775	1,889	1,979	2,047	122	182	202	215	226	236	244
1561	G	LEE	LEE COUNTY WSC	7,557	8,497	9,036	9,233	9,365	9,435	122	959	1,046	1,093	1,106	1,119	1,127
			LEE COUNTY WSC TOTAL	9,990	11,446	12,530	13,395	14,365	15,497	122	1,268	1,409	1,516	1,604	1,716	1,850
1606	K	LLANO	LLANO	3,565	3,759	3,754	3,689	3,814	3,943	226	862	891	877	855	883	913
1627	K	TRAVIS	LOOP 360 WSC	2,086	2,169	2,262	2,344	2,420	2,556	532	1,225	1,268	1,318	1,363	1,407	1,486
1675	K	TRAVIS	MANOR	8,650	12,017	15,193	18,750	21,889	24,808	122	1,110	1,517	1,907	2,346	2,736	3,099
1680	K	TRAVIS	MANVILLE WSC	22,045	27,156	31,976	37,373	42,136	46,566	148	3,434	4,148	4,835	5,623	6,329	6,991
1680	G	WILLIAMSON	MANVILLE WSC	10,728	13,476	16,900	20,586	24,767	29,089	148	1,671	2,058	2,555	3,097	3,720	4,367
			MANVILLE WSC TOTAL	32,773	40,632	48,876	57,959	66,903	75,655	148	5,105	6,206	7,390	8,720	10,049	11,358
1683	K	BURNET	MARBLE FALLS	8,784	12,906	18,684	21,713	23,732	24,741	250	2,354	3,400	4,884	5,661	6,184	6,446
1690	K	MATAGORDA	MARKHAM MUD	1,013	1,066	1,101	1,127	1,146	1,159	112	116	117	116	118	119	120
1711	K	MATAGORDA	MATAGORDA COUNTY WCID 6	1,099	1,158	1,194	1,223	1,244	1,258	101	113	113	112	113	115	116
1712	K	MATAGORDA	MATAGORDA WASTE DISPOSAL & WSC	691	728	751	769	781	792	173	127	130	131	133	135	137
1743	K	BURNET	MEADOWLAKES MUD	2,540	3,074	3,524	3,954	4,332	4,660	308	852	1,020	1,163	1,301	1,425	1,532
1946	K	TRAVIS	NORTH AUSTIN MUD 1	780	780	780	780	780	780	101	81	78	76	75	75	75
1946	K	WILLIAMSON	NORTH AUSTIN MUD 1	7,442	7,442	7,442	7,442	7,442	7,442	101	774	747	726	714	711	711
			NORTH AUSTIN MUD 1 TOTAL	8,222	8,222	8,222	8,222	8,222	8,222	101	855	825	802	789	786	786
1972	K	SAN SABA	NORTH SAN SABA WSC	647	678	681	671	686	702	264	185	191	190	187	191	195
1988	K	TRAVIS	NORTHTOWN MUD	10,834	12,509	14,091	15,859	17,421	18,874	60	728	841	947	1,066	1,171	1,268
2022	K	TRAVIS	OAK SHORES WATER SYSTEM	467	553	636	696	746	802	253	128	149	171	186	199	214
2074	K	MATAGORDA	PALACIOS	5,019	5,283	5,453	5,584	5,677	5,743	130	677	688	691	698	708	716
2137	K	TRAVIS	PFLUGERVILLE	62,745	85,016	106,017	129,532	150,287	169,592	155	10,403	13,928	17,298	21,087	24,438	27,564
2137	G	WILLIAMSON	PFLUGERVILLE	373	469	588	717	862	1,013	155	62	77	96	117	140	165
			PFLUGERVILLE TOTAL	63,118	85,485	106,605	130,249	151,149	170,605	155	10,465	14,005	17,394	21,204	24,578	27,729
2179	K	BASTROP	POLONIA WSC	236	300	385	498	653	858	120	29	36	45	58	76	100
2179	L	CALDWELL	POLONIA WSC	7,189	8,801	10,393	11,966	13,556	15,103	120	890	1,055	1,222	1,395	1,576	1,755
			POLONIA WSC TOTAL	7,425	9,101	10,778	12,464	14,209	15,961	120	919	1,091	1,267	1,453	1,652	1,855
2296	K	SAN SABA	RICHLAND SUD	956	1,002	1,007	991	1,015	1,038	135	136	139	137	133	136	139
2296	F	MCCULLOCH	RICHLAND SUD	999	1,041	1,045	1,056	1,058	1,060	135	142	144	142	142	142	142
			RICHLAND SUD TOTAL	1,955	2,043	2,052	2,047	2,073	2,098	135	278	283	279	275	278	281
2350	K	TRAVIS	ROLLINGWOOD	1,421	1,429	1,436	1,444	1,451	1,458	250	383	379	375	374	375	377
2368	K	TRAVIS	ROUND ROCK	1,732	2,003	2,258	2,544	2,796	3,030	152	278	315	352	395	434	470
2368	G	WILLIAMSON	ROUND ROCK	157,819	198,258	248,614	302,845	364,345	427,932	152	25,287	31,213	38,796	47,061	56,537	66,365
			ROUND ROCK TOTAL	159,551	200,261	250,872	305,389	367,141	430,962	152	25,565	31,528	39,148	47,456	56,971	66,835
2421	K	SAN SABA	SAN SABA	3,384	3,546	3,565	3,507	3,591	3,673	319	1,175	1,216	1,212	1,186	1,213	1,241
2438	K	FAYETTE	SCHULENBURG	3,147	3,592	3,894	4,143	4,339	4,490	209	701	783	838	885	926	958
2457	K	TRAVIS	SENNA HILLS MUD	1,219	1,445	1,660	1,818	1,947	2,093	316	420	493	564	616	659	708
2468	K	TRAVIS	SHADY HOLLOW MUD	4,366	4,366	4,366	4,366	4,366	4,366	151	695	677	661	653	651	651
2533	K	BASTROP	SMITHVILLE	4,797	6,308	8,273	10,933	14,527	19,306	164	821	1,048	1,351	1,774	2,353	3,125
2650	K	LLANO	SUNRISE BEACH VILLAGE	720	724	723	721	723	726	100	74	71	69	68	68	68
2655	K	TRAVIS	SUNSET VALLEY	1,179	1,414	1,725	2,074	2,383	2,669	312	400	476	578	694	797	892

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				TWDB Draft Projections for 2022 State Water Plan												
RWP Utility ID	Region	County	Water User Group (WUG) Name	Population 2020	Population 2030	Population 2040	Population 2050	Population 2060	Population 2070	Base GPCD	Municipal Demands 2020 (Ac-Ft/Yr)	Municipal Demands 2030 (Ac-Ft/Yr)	Municipal Demands 2040 (Ac-Ft/Yr)	Municipal Demands 2050 (Ac-Ft/Yr)	Municipal Demands 2060 (Ac-Ft/Yr)	Municipal Demands 2070 (Ac-Ft/Yr)
2773	K	TRAVIS	TRAVIS COUNTY MUD 10	348	412	474	519	556	597	260	98	115	131	143	153	164
2775	K	TRAVIS	TRAVIS COUNTY MUD 14	2,015	2,388	2,742	3,003	3,218	3,459	84	172	196	220	238	254	273
2777	K	TRAVIS	TRAVIS COUNTY MUD 2	2,527	2,994	3,439	3,767	4,036	4,338	142	379	439	498	542	580	623
2778	K	TRAVIS	TRAVIS COUNTY MUD 4	2,446	2,825	3,182	3,581	3,934	4,263	755	2,051	2,365	2,662	2,994	3,288	3,563
2779	K	TRAVIS	TRAVIS COUNTY WCID 10	7,628	8,364	9,058	9,835	10,521	11,160	319	2,644	2,865	3,080	3,332	3,561	3,776
2780	K	TRAVIS	TRAVIS COUNTY WCID 17	33,117	39,741	43,715	44,473	45,671	47,125	236	8,450	10,053	11,016	11,186	11,479	11,841
2781	K	TRAVIS	TRAVIS COUNTY WCID 18	6,344	7,324	8,250	9,287	10,201	11,051	160	1,070	1,207	1,341	1,499	1,643	1,779
2782	K	TRAVIS	TRAVIS COUNTY WCID 19	682	682	682	682	682	682	628	474	472	470	469	469	469
2783	K	TRAVIS	TRAVIS COUNTY WCID 20	1,130	1,130	1,130	1,130	1,130	1,130	469	584	581	579	577	577	577
2784	K	TRAVIS	TRAVIS COUNTY WCID POINT VENTURE	723	1,215	1,568	1,900	2,273	2,601	283	222	370	474	573	685	783
2922	K	COLORADO	WEIMAR	2,164	2,257	2,329	2,431	2,516	2,600	229	532	545	554	574	593	613
2929	K	TRAVIS	WELLS BRANCH MUD	14,989	14,989	14,989	14,989	14,989	14,989	107	1,638	1,601	1,576	1,562	1,558	1,558
2929	K	WILLIAMSON	WELLS BRANCH MUD	1,073	1,073	1,073	1,073	1,073	1,073	107	117	115	113	112	112	112
			WELLS BRANCH MUD TOTAL	16,062	16,062	16,062	16,062	16,062	16,062	107	1,755	1,716	1,689	1,674	1,670	1,670
2940	K	FAYETTE	WEST END WSC	1,197	1,366	1,521	1,686	1,855	2,032	107	130	142	153	167	183	201
2940	G	WASHINGTON	WEST END WSC	487	555	618	686	753	826	107	53	58	62	68	74	82
2940	H	AUSTIN	WEST END WSC	1,835	2,092	2,330	2,582	2,843	3,114	107	199	218	235	256	281	308
			WEST END WSC TOTAL	3,519	4,013	4,469	4,954	5,451	5,972	107	382	418	450	491	538	591
2953	K	HAYS	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	12,788	18,076	24,517	32,568	41,666	52,021	391	5,501	7,739	10,476	13,901	17,775	22,188
2953	K	TRAVIS	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	7,394	8,537	9,615	10,824	11,890	12,880	391	3,181	3,655	4,109	4,620	5,072	5,494
			WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY TOTAL	20,182	26,613	34,132	43,392	53,556	64,901	391	8,682	11,394	14,585	18,521	22,847	27,682
2974	K	WHARTON	WHARTON	9,427	10,033	10,516	10,934	11,320	11,662	169	1,680	1,738	1,782	1,837	1,898	1,955
2976	K	WHARTON	WHARTON COUNTY WCID 2	2,235	2,379	2,493	2,593	2,684	2,765	192	456	474	488	503	520	535
3013	K	TRAVIS	WILLIAMSON COUNTY WSID 3	910	1,143	1,143	1,143	1,143	1,143	126	120	147	145	144	144	144
3013	G	WILLIAMSON	WILLIAMSON COUNTY WSID 3	2,323	2,917	3,626	4,389	5,255	6,154	126	307	376	461	554	662	775
			WILLIAMSON COUNTY WSID 3 TOTAL	3,233	4,060	4,769	5,532	6,398	7,297	126	427	523	606	698	806	919
3014	G	WILLIAMSON	WILLIAMSON TRAVIS COUNTIES MUD 1	4,596	4,596	4,596	4,596	4,596	4,596	126	598	584	576	572	571	570
3014	K	TRAVIS	WILLIAMSON TRAVIS COUNTIES MUD 1	1,113	1,113	1,113	1,113	1,113	1,113	126	145	141	139	139	138	138
			WILLIAMSON TRAVIS COUNTIES MUD 1 TOTAL	5,709	5,709	5,709	5,709	5,709	5,709	126	743	725	715	711	709	708
3026	K	TRAVIS	WINDERMERE UTILITY	17,866	17,866	17,866	17,866	17,866	17,866	154	2,920	2,864	2,831	2,815	2,810	2,809
3090	K	MILLS	ZEPHYR WSC	39	39	39	39	39	39	82	3	3	3	3	3	4
3090	F	BROWN	ZEPHYR WSC	4,173	4,173	4,173	4,173	4,173	4,173	82	343	339	330	325	324	324
			ZEPHYR WSC TOTAL	4,212	4,212	4,212	4,212	4,212	4,212	82	346	342	333	328	327	328

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February 26, 2018

Subject: Lower Colorado Regional Water Planning Area (Region K)
Water Supplies and Strategies for 2021 Regional Water Plan
Please Review and Respond by March 30, 2018

Dear Water Utility Representative:

Our Lower Colorado Regional Water Planning Group (Region K RWPG) is currently in the middle of the planning cycle for developing the 2021 Region K Water Plan, which becomes part of the Texas State Water Plan, and we need your assistance to ensure we're including accurate information for your water utility. Please review this letter, fill out the attached survey, and send it back to us by **March 30, 2018.**

It is a responsibility of the Region K RWPG, per the Texas Administrative Code (TAC), to identify and evaluate water **supplies** and **strategies** for each water user group within Region K. This is done to plan for potential water needs for a period from 2020 to 2070 and identify potential projects to meet those needs. This long-term water supply planning effort assists the State of Texas in determining what levels of funding for water supply projects may be needed over the next several decades. Projects applying for certain types of state funds must be recommended in the Regional Water Plan to be eligible.

> **Supplies** [31 TAC 357.32(a)]:
> *"Regional Water Planning Groups shall evaluate:*
> 1. *Source water availability during Drought of Record conditions; and*
> 2. *Existing water supplies that are legally and physically available to Water User Groups and wholesale water providers within a Regional Water Planning Area for use during the Drought of Record."*

In accordance with the Texas Water Development Board (TWDB) guidelines, the five basic types of water supply that exist within Region K are: surface water supplies; groundwater supplies; supplies available through contractual arrangements; supplies available through the operation of a system of reservoirs or other supplies; and reclaimed water (reuse).

On the attached survey, we have listed the existing water supply sources that were identified for your water utility in the **2016** Region K Water Plan. We ask that you review the listed supplies, identify if they are correct, and then provide some additional associated details. There is also room to list additional sources that may be new or were perhaps missed during the last planning cycle.

> **Strategies** [31 TAC 357.34(a)]:
> *"Regional Water Planning Groups shall identify and evaluate potentially feasible Water Management Strategies and the Water Management Strategy Projects required to implement those strategies for all Water User Groups and wholesale water providers with identified Water Needs [shortages]."*

On the attached survey, we have also listed the water management strategies that were recommended for your water utility in the **2016** Region K Water Plan. We ask that you review the list and provide a checkmark next to the ones that you think should be kept as recommended strategies for the **2021** Region K Water Plan. If you do not recognize the strategies selected for your utility, it may be because feedback was not provided during the previous cycle. As stated above, the TAC requires the Region K RWPG to recommend water management strategies to meet identified water needs, even if a water user group chooses not to provide input.

Additional potentially feasible water management strategies are listed in the attached document, as well. Please identify, using “Y” or “N”, which ones may be potentially feasible as strategies for your utility. If you answer “Y”, please provide any additional details you have at this time. Even if a water shortage during Drought of Record conditions is not predicted for your utility in the next 50 years, it is common to have plans for conservation and/or drought management.

The Region K RWPG asks that you fill out and return the attached survey regarding supplies and strategies by **March 30, 2018**. If you are unsure about strategies at this time, please fill out and return the ‘Supplies’ portion, and we will reach out to you regarding strategies in the next several months.

If you are aware of a water infrastructure project(s) your water utility is currently considering that would support the implementation of a strategy listed on the attached survey, please provide Region K with any details you have about the project(s) in the space provided, so that it may be considered for recommendation in the 2021 Region K Water Plan. The State Water Implementation Fund for Texas (SWIFT) is dedicated to financing water projects by providing low-interest loans. To be eligible for this funding, the water project *must* be recommended in the 2021 Regional Water Plan.

If we do not hear back from you, the Region K RWPG is still responsible for identifying water supplies and water management strategies for your utility through 2070, which ideally are based on your recommendations, so any input you can provide would be appreciated.

If you have any questions regarding the attached survey or the planning process in general, we’re happy to help answer them. I may be reached directly at (512) 457-7798 or at jaime.burke@aecom.com. For additional information, please also visit Region K’s website at www.regionk.org.

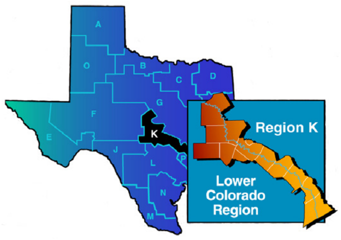
Thanks for your participation!

Sincerely,

Jaime J Burke

Jaime Burke, P.E.
Project Manager
AECOM
Consultant for the Region K RWPG

Lower Colorado Regional Water Planning Area (Region K)
AQUA WSC



Please complete this form and return to Jaime Burke at jaime.burke@aecom.com or AECOM, 9400 Amberglen Blvd, Building E, Austin, TX 78729

SUPPLIES

Existing Water Supply Sources Identified in 2016 Regional Water Plan		(✓) Correct?	If correct, please identify the following volumes or rates:		
Source County	**Supply Source**		**Current legal contracted or permitted amount**	**Pumping/Intake Capacity**	**Treatment Capacity**
Bastrop	*Carrizo-Wilcox Aquifer*				
Caldwell	*Carrizo-Wilcox Aquifer*				

Additional sources not identified above:

Source County	Supply Source	Current legal contracted or permitted amount	Pumping/Intake Capacity	Treatment Capacity

STRATEGIES

Water Management Strategies Recommended in 2016 Regional Water Plan		(✓) Keep for 2021 Regional Water Plan?
	Conservation	
	Drought Management	
	Expansion of Groundwater Supply (Bastrop County, Carrizo-Wilcox Aquifer)	
	New LCRA Contract w/ surface water infrastructure (Bastrop County, 2040)	

Potentially Feasible Strategies for 2021 Regional Water Plan	Y/N	If yes, please explain water sources and/or details:
**Expanded use of existing supplies*		
***New supply development*		
Conservation and drought management measures		
Reuse of wastewater (reclaimed water)		
Interbasin transfers of surface water		
Emergency transfers of surface water		

* Expanded use of existing supplies including system optimization and conjunctive use of water resources, reallocation of reservoir storage to new uses, voluntary redistribution of water resources including contracts, water marketing, regional water banks, sales, leases, options, subordination agreements, and financing agreements, subordination of existing water rights through voluntary agreements, enhancements of yields of existing sources, and improvement of water quality including control of naturally occurring chlorides.

** New supply development including construction and improvement of surface water and groundwater resources, brush control, precipitation enhancement, seawater desalination, brackish groundwater desalination, water supply that could be made available by cancellation of water rights based on data provided by the Commission, rainwater harvesting, and aquifer storage and recovery.

WATER UTILITY CONTACT ______________________ **EMAIL** ______________________ **PHONE** ____________

AECOM
9400 Amberglen Blvd 512 454 4797 tel
Austin, TX 78729 512 454 8807 fax
www.aecom.com

February 26, 2018

**Subject: Lower Colorado Regional Water Planning Area (Region K)
Water Supplies and Strategies for 2021 Regional Water Plan
Please Review and Respond by March 30, 2018**

Dear Water Utility Representative:

Our Lower Colorado Regional Water Planning Group (Region K RWPG) is currently in the middle of the planning cycle for developing the 2021 Region K Water Plan, which becomes part of the Texas State Water Plan, and we need your assistance to ensure we're including accurate information for your water utility. Please review this letter, fill out the attached survey, and send it back to us by **March 30, 2018**. If your utility is new to regional water planning this cycle and you have questions regarding this request, please call or email and we'll be glad to explain the process in further detail. Contact information is provided at the end of this letter.

It is a responsibility of the Region K RWPG, per the Texas Administrative Code (TAC), to identify and evaluate water **supplies** and **strategies** for each water user group within Region K. This is done to plan for potential water needs for a period from 2020 to 2070 and identify potential projects to meet those needs. This long-term water supply planning effort assists the State of Texas in determining what levels of funding for water supply projects may be needed over the next several decades. Projects applying for certain types of state funds must be recommended in the Regional Water Plan to be eligible.

> **Supplies** [31 TAC 357.32(a)]:
> *"Regional Water Planning Groups shall evaluate:*
> 1. *Source water availability during Drought of Record conditions; and*
> 2. *Existing water supplies that are legally and physically available to Water User Groups and wholesale water providers within a Regional Water Planning Area for use during the Drought of Record."*

In accordance with the Texas Water Development Board (TWDB) guidelines, the five basic types of water supply that exist within Region K are: surface water supplies; groundwater supplies; supplies available through contractual arrangements; supplies available through the operation of a system of reservoirs or other supplies; and reclaimed water (reuse).

On the attached survey, we are asking you to list your utility's current source(s) of water supply. Please include the specific body of water or aquifer, and/or whether you purchase water through a contract with a provider. Including additional details regarding contract or permit volumes (e.g. acre-feet/year), pumping or intake capacity (e.g. well gpm), and treatment capacity (e.g. treatment plant MGD) for each source helps us determine the current legal and physical availability of the supply to your utility, as required under 31 TAC 357.32(a) above.

> **Strategies** [31 TAC 357.34(a)]:
> *"Regional Water Planning Groups shall identify and evaluate potentially feasible Water Management Strategies and the Water Management Strategy Projects required to implement those strategies for all Water User Groups and wholesale water providers with identified Water Needs [shortages]."*

On the attached survey, we are also asking you to let us know what kinds of water management strategies your utility might implement to meet any potential water shortages through 2070. Please identify, using "Y" or "N", which ones may be potentially feasible as strategies for your utility. If you answer "Y", please provide any additional details you have at this time. Even if a water shortage during Drought of Record conditions is not predicted for your utility in the next 50 years, it is common to have plans for conservation and/or drought management. As stated above, the TAC requires the Region K RWPG to recommend water management strategies to meet identified water needs, even if a water user group chooses not to provide input.

If you are aware of a water infrastructure project(s) your water utility is currently considering that would support the implementation of a strategy listed on the attached survey, please provide Region K with any details you have about the project(s) in the space provided, so that it may be considered for recommendation in the 2021 Region K Water Plan. The State Water Implementation Fund for Texas (SWIFT) is dedicated to financing water projects by providing low-interest loans. To be eligible for this funding, the water project *must* be recommended in the 2021 Regional Water Plan.

> Example: Expanding the use of your existing groundwater source would be a water management strategy. Needing to install an additional well or transmission line in order to supply additional volume from the existing groundwater source would be a water infrastructure project associated with the strategy.

The Region K RWPG asks that you fill out and return the attached survey regarding supplies and strategies by **March 30, 2018**. If you are unsure about strategies at this time, please fill out and return the 'Supplies' portion, and we will reach out to you regarding strategies in the next several months.

If we do not hear back from you, the Region K RWPG is still responsible for identifying water supplies and water management strategies for your utility through 2070, which ideally are based on your recommendations, so any input you can provide would be appreciated.

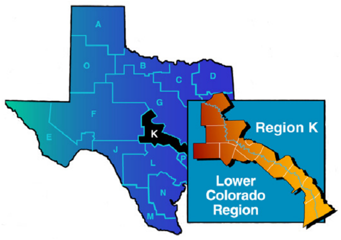
If you have any questions regarding the attached survey or the planning process in general, we're happy to help answer them. I may be reached directly at (512) 457-7798 or at jaime.burke@aecom.com. For additional information, please also visit Region K's website at www.regionk.org.

Thanks for your participation!

Sincerely,

Jaime Burke, P.E.
Project Manager
AECOM
Consultant for the Region K RWPG

Lower Colorado Regional Water Planning Area (Region K)
BARTON CREEK WSC



Please complete this form and return to Jaime Burke at jaime.burke@aecom.com or AECOM, 9400 Amberglen Blvd, Building E, Austin, TX 78729

SUPPLIES

Water Supply Sources to Identify for 2021 Regional Water Plan (include aquifer name, river/reservoir name, reuse, and/or contract provider)

Source County	Supply Source	Current legal contracted or permitted amount	Pumping/Intake Capacity	Treatment Capacity

STRATEGIES

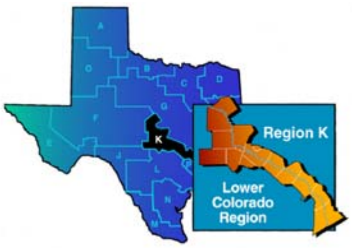
Potentially Feasible Strategies for 2021 Regional Water Plan	Y/N	If yes, please explain water sources and/or details:
**Expanded use of existing supplies*		
***New supply development*		
Conservation and drought management measures		
Reuse of wastewater (reclaimed water)		
Interbasin transfers of surface water		
Emergency transfers of surface water		

* Expanded use of existing supplies including system optimization and conjunctive use of water resources, reallocation of reservoir storage to new uses, voluntary redistribution of water resources including contracts, water marketing, regional water banks, sales, leases, options, subordination agreements, and financing agreements, subordination of existing water rights through voluntary agreements, enhancements of yields of existing sources, and improvement of water quality including control of naturally occurring chlorides.

** New supply development including construction and improvement of surface water and groundwater resources, brush control, precipitation enhancement, seawater desalination, brackish groundwater desalination, water supply that could be made available by cancellation of water rights based on data provided by the Commission, rainwater harvesting, and aquifer storage and recovery.

WATER UTILITY CONTACT ______________________ **EMAIL** ______________________ **PHONE** ____________

From: Smiley, Alicia <Alicia.Smiley@aecom.com>
Sent: Monday, November 25, 2019 5:48 PM
To:
Subject: Region K Implementation Survey for 2021 Regional Water Plan - Please Respond by December 13, 2019



Dear Water Utility Representative:

Our Lower Colorado Regional Water Planning Group (Region K RWPG) is developing the 2021 Region K Water Plan, which becomes part of the 2022 Texas State Water Plan. Please review this letter, fill out the attached survey(s) in PDF form, and return by **December 13, 2019**.

It is a responsibility of the Region K RWPG, per the Texas Administrative Code (TAC), to collect information on implementation and reported impediments to implementation for water management strategies (WMS) and WMS projects in the 2016 Regional Water Plans/2017 State Water Plan.

> **Implementation and Comparison to Previous Regional Water Plan** [31 TAC 357.45(a)]:
> *"RWPGs shall describe the level of implementation of previously recommended WMSs and associated impediments to implementation in accordance with guidance provided by the board. Information on the progress of implementation of all WMSs that were recommended in the previous RWP, including conservation and Drought Management WMSs; and the implementation of WMSPs that have affected progress in meeting the state's future water needs."*

The attached survey(s) include your utility's recommended water management strategies from the 2016 Region K Water Plan; some of these strategies were planned to be online by 2020.

When filling out the survey(s), we ask that you answer the questions in your PDF viewer and return electronically; many questions have dropdown option menus that are not available in print form. Alternatively, you may call us to help you with the process.

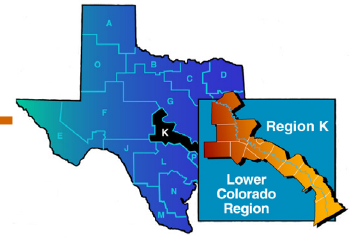
If you have any questions regarding the attached survey or the planning process in general, we're happy to help answer them. I may be reached directly at (512) 419-5073 or at alicia.smiley@aecom.com.

Thanks for your participation!

Sincerely,

Alicia Smiley, EIT
Project Engineer
AECOM
Consultant for the Region K RWPG

Lower Colorado Regional Water Planning Area (Region K)
AQUA WSC



Please complete this survey and return to Alicia Smiley at alicia.smiley@aecom.com. Assistance can be provided in answering questions or filling out the survey at 512-419-5073.

IMPLEMENTATION SURVEY

Water Management Strategy Recommended in 2016 Regional Water Plan	*Drought Management*

Drought management is the implementation of drought trigger responses due to drought conditions based on the utility's individual Drought Contingency Plan (DCP).

Has Sponsor taken affirmative vote or actions? (TWC 16.053(h)(10)) -

If yes, in what year did this occur? __________

If yes, by what date is the action on schedule for implementation? __________

At what level of implementation is the project currently?

-

If not implemented, why? -

If other, please describe __________

What impediments are there to implementation? -

If other, please describe __________

Year the project is online -

Current water supply project yield (ac-ft/yr) __________

Funds expended to date ($) __________

Project Cost ($) __________

Is this a phased project? -

If yes, provide ultimate volume (ac-ft/yr) __________

If yes, provide ultimate project cost ($) __________

What is the project funding source(s)? -

Funding Mechanism if other? __________

Year project reaches maximum capacity? -

Does the project or WMS involve reallocation of flood control? -

Does the project or WMS provide any measurable flood risk reduction?

-

Optional Comments

____

____

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APPENDICES

CHAPTER 11 : IMPLEMENTATION AND COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

This chapter presents a discussion and survey of water management strategy projects that were recommended in the 2016 Regional Water Plan and have since been implemented, as well as providing a summary comparison of the 2021 Regional Water Plan to the 2016 Regional Water Plan with respect to population, demands, water availability and supplies, and water management strategies.

11.1 IMPLEMENTATION

The Texas Water Development Board (TWDB) uses a survey to track the implementation status of all recommended strategies from the previous planning cycle. The TWDB survey template was used to collect the required information from the Water User Groups (WUGs) and wholesale water providers in the region. *Appendix 11A* contains two versions of the Implementation Template used to record the survey results. *Table 11A.1* is a shortened summary version of the results, based on survey responses. *Table 11A.2* is the full version of the TWDB template containing all of the information based on survey responses, presented to meet TWDB requirements. As of January 2020, seventeen (17) project sponsors had responded to the survey.

In general, water management strategies related to return flows, conservation, reuse, drought management, and new water sale contracts and contract amendments have been implemented to some extent since the 2016 Region K Water Plan. Based on responses to date, approximately twenty-five (25) of the water management strategies recommended in the 2016 Region K Water Plan were found to either be currently operating or to have all phases implemented. Based on responses to date, fifteen (15) others have been initiated or are in some state of progress. Supply numbers that were provided in the surveys have been included in the results tables in *Appendix 11A*. Many of these particular strategies are on-going and will continue to be recommended and implemented during future planning cycles.

Results showed that thirteen (13) water management strategies with capital costs that were recommended in the 2016 Region K Water Plan have been implemented to the point of operation. These projects include the following:

- City of Austin Direct Non-Potable Reuse
- City of Austin Other Reuse
- City of Austin Rainwater Harvesting
- City of Austin Conservation
- Direct Reuse – Buda
- Direct Reuse – Horseshoe Bay
- Direct Reuse – Pflugerville

- LCRA – Lane City Off-Channel Reservoir
- Expansion of Carrizo-Wilcox Aquifer Supplies – Aqua WSC
- Municipal Conservation – Bertram
- Municipal Conservation – Buda
- Municipal Conservation – Cedar Park
- Municipal Conservation – Horseshoe Bay
- Municipal Conservation – Smithville

Several of the reuse and conservation strategies are considered to be on-going and will continue to be recommended in future planning cycles. Implementation costs and water supply volumes are included in *Appendix 11A*, as available. Generally, strategies that are currently operating without capital costs include strategies such as Drought Management and Conservation for some Water User Groups.

Based on survey responses, a number of additional strategies recommended in the 2016 Region K Water Plan are underway, but not currently to the point of operation. This includes strategies that have permit applications submitted, are performing feasibility studies, or are in some stage of planning, design, or construction. The following projects have been started, but have not been completed:

- City of Austin Return Flows
- Drought Management – Fayette WSC
- Expansion of Carrizo-Wilcox Aquifer Supplies – LCRA
- Expansion of Ellenburger-San Saba Aquifer Supplies – Bertram
- LCRA – Acquire Additional Water Rights
- LCRA – Contract Amendments
- LCRA – New LCRA Contracts
- LCRA – Excess Flows Permit Off-Channel Reservoir
- LCRA – Mid-Basin Off-Channel Reservoir
- Municipal Conservation – Pflugerville
- Urgent Water Loss Reduction Project – Creedmoor-Maha WSC
- BS/EACD Edwards/Middle Trinity ASR

See *Appendix 11A* for additional information related to these and the rest of the water management strategies that were recommended in the 2016 Region K Water Plan.

11.2 COMPARISON TO THE PREVIOUS REGIONAL WATER PLAN

This section discusses how the 2021 Regional Water Plan compares to the 2016 Regional Water Plan, with respect to population, water demands, water supplies, and water management strategies.

11.2.1 Population Projections

The major change related to population that was made for the 2021 Region K Plan is related to the definition of a municipal Water User Group (WUG). In the 2016 Region K Plan, municipal WUGs were both city-based and utility-based. For the 2021 Region K Plan, the municipal WUGs are all utility-based. In addition, the threshold for being defined as an individual WUG changed so that water utilities providing more than 100 ac-ft/yr of water met the definition. In the 2016 Region K Plan, the threshold was 280 ac-ft/yr. This changed increased the number of municipal WUGs in the region as compared to the 2016 Region K Plan.

Overall for Region K, there is a population projection increase of approximately 25,000 for Year 2020 between the 2016 Region K Plan and the 2021 Region K Plan. By 2070, the 2021 Region K Plan shows a population projection that is approximately 47,000 higher than the 2070 population projection in the 2016 Region K Plan. The rate of population projection growth by planning decade is approximately the same as (no change from) the rates shown in the 2016 Region K Plan. Tabular data and bar graphs comparing the two (2) plans can be found in *Appendix 11B*.

Overall, population estimates for most counties have not changed between the 2016 Region K Plan and the 2021 Region K Plan. Travis County was found to have a higher population projection predicted by year 2070 in the 2021 RWP, as compared to the 2016 Region K Plan. All other counties were found to have no change in population projection by Year 2070.

Overall, population projection growth rates for most counties have not changed between the 2016 Region K Plan and the 2021 Region K Plan. Travis County was found to have a negligibly faster population projection growth rate (<0.1% increase) in the 2021 RWP, as compared to the 2016 Region K Plan. All other counties were found to have no change in population projection growth rate.

These changes by county are summarized in *Table 11.1*.

Table 11.1: Comparison of 2021 Region K Plan and 2016 Region K Plan with respect to the 2070 Population Projections and Overall Projection Growth Rates by County

County	Population in Year 2070 (2021 RWP compared to 2016 RWP)	Population Growth Rate (2021 RWP compared to 2016 RWP)
Bastrop	No Change	No Change
Blanco	No Change	No Change
Burnet	No Change	No Change
Colorado	No Change	No Change
Fayette	No Change	No Change
Gillespie	No Change	No Change
Hays (partial)	No Change	No Change
Llano	No Change	No Change
Matagorda	No Change	No Change
Mills	No Change	No Change
San Saba	No Change	No Change
Travis	Increase	Negligible Increase
Wharton (partial)	No Change	No Change
Williamson (partial)	No Change	No Change
Total (Region K)	**Increase**	**No Change**

11.2.2 Water Demand Projections

Overall for Region K, there is a decrease in water demand of approximately 66,000 acre-feet/year for Year 2020 between the 2016 Region K Plan and the 2021 Region K Plan. By 2070, the 2021 Region K Plan shows a total water demand that is approximately 154,000 acre-feet/year lower than the 2070 total water demand in the 2016 Region K Plan. The rate of water demand growth by planning decade is approximately 1.1% lower than was shown in the 2016 Region K Plan. Tabular data and bar graphs comparing the two plans can be found in *Appendix 11B*. Water demand projection methodologies for this cycle are discussed in *Chapter 2*.

Water demand projections for each usage category have changed between the 2016 Region K Plan and the 2021 Region K Plan. Only the municipal water usage category has a higher water demand predicted by Year 2070 in the 2021 Region K Plan. The remaining water usage categories had a smaller water demand predicted by Year 2070 in the 2021 Region K Plan: Livestock, Irrigation, Manufacturing, Mining, and Steam-Electric Power Generation.

Water demand projection growth rates for each usage category have also changed between the 2016 Region K Plan and the 2021 Region K Plan. The following water usage categories had a less than one percent (1%) change in the water demand projection growth rate when comparing the 2021 Region K Plan to the 2016 Region K Plan: Municipal, Livestock, and Irrigation. The remaining water usage categories had slower demand projection rates in the 2021 Region K Plan, as compared to the 2016 Region K Plan: Manufacturing, Mining, and Steam-Electric Power Generation.

These changes are summarized in *Table 11.2*.

Table 11.2: Demand Change in Year 2070 by Water Usage Category, from 2016 to 2021 Region K Plan

Water Usage Category	Water Demand in Year 2070 (2021 RWP compared to 2016 RWP)	Water Demand Growth Rate (2021 RWP compared to 2016 RWP)
Municipal	Increase	No Change
Livestock	Decrease	No Change
Irrigation	Decrease	No Change
Manufacturing	Decrease	Decrease
Mining	Decrease	Decrease
Steam-Electric Power Generation	Decrease	Decrease
Total Water Demand	**Decrease**	**Decrease**

Table 11.3 identifies counties that have a higher projected water demand by Year 2070 in the 2021 Region K Plan than was shown in the 2016 Region K Plan, based on all water use categories. In addition, the usage category that has the greatest impact on that county's growth is shown in *Table 11.3*.

Table 11.3: Counties with Year 2070 Total Water Demand Increase from 2016 to 2021 Region K Plan

County	Total Water Demand Increase in Year 2070 (acre-feet/year)	Greatest Water Usage Category Increase
Blanco	801	Irrigation
Colorado	11,553	Irrigation
Mills	1,919	Irrigation
San Saba	2,294	Irrigation
Williamson (partial)	1,201	Municipal

Table 11.4 identifies counties that have a lower projected water demand by Year 2070 than was shown in the 2016 Region K Plan. In addition, the water usage category that has the greatest impact on each county's decrease is shown in *Table 11.4*.

Table 11.4: Counties with Year 2070 Total Water Demand Decrease from 2011 RWP

County	Total Water Demand Decrease in Year 2070 (acre-feet/year)	Greatest Water Usage Category Decrease
Bastrop	-13,930	Mining
Burnet	-1,849	Manufacturing
Fayette	-4,054	Steam-Electric Power Generation
Gillespie	-511	Manufacturing
Hays (partial)	-738	Municipal
Llano	-1,639	Irrigation
Matagorda	-55,156	Steam-Electric Power Generation
Travis	-78,275	Manufacturing
Wharton (partial)	-15,780	Irrigation

11.2.3 Drought of Record and Hydrologic Assumptions

The Drought of Record for the 2016 Region K Water Plan occurred from 1947-1957, while the Drought-of-Record for the 2021 Region K Water Plan occurred from 2007-2016. The Region K Cutoff Model was used in both plans for determining the surface water availability numbers. In the 2016 Region K Plan, the period of record was from 1940-2013, with a critical dry year of 2011. For the 2021 Region K Plan, the period of record was from 1940-2016, with a critical dry year of 2011. Hydrologic assumptions for the surface water modeling involving the Region K Cutoff Model are included in *Chapter 3*.

11.2.4 Groundwater and Surface Water Availability and Water Supplies

Overall for Region K, the total water source availability in the 2021 Region K Plan has slightly increased from the availability in the 2016 Region K Plan. In the 2016 Region K Plan, the total water availability for 2020 is approximately 1.29 million acre-feet/year, with 75 percent surface water and 25 percent groundwater. In the 2021 Region K Plan, the total water availability for 2020 and 2070 was approximately 1.3 million acre-feet/year, with 71 percent surface water and 29 percent groundwater.

Figure 11.1 shows a comparison of water availability by type of source, for 2020 and 2070, in the 2016 Region K Plan and the 2021 Region K Plan.

Figure 11.1: Comparison of Water Availability by Type of Source for 2020 and 2070

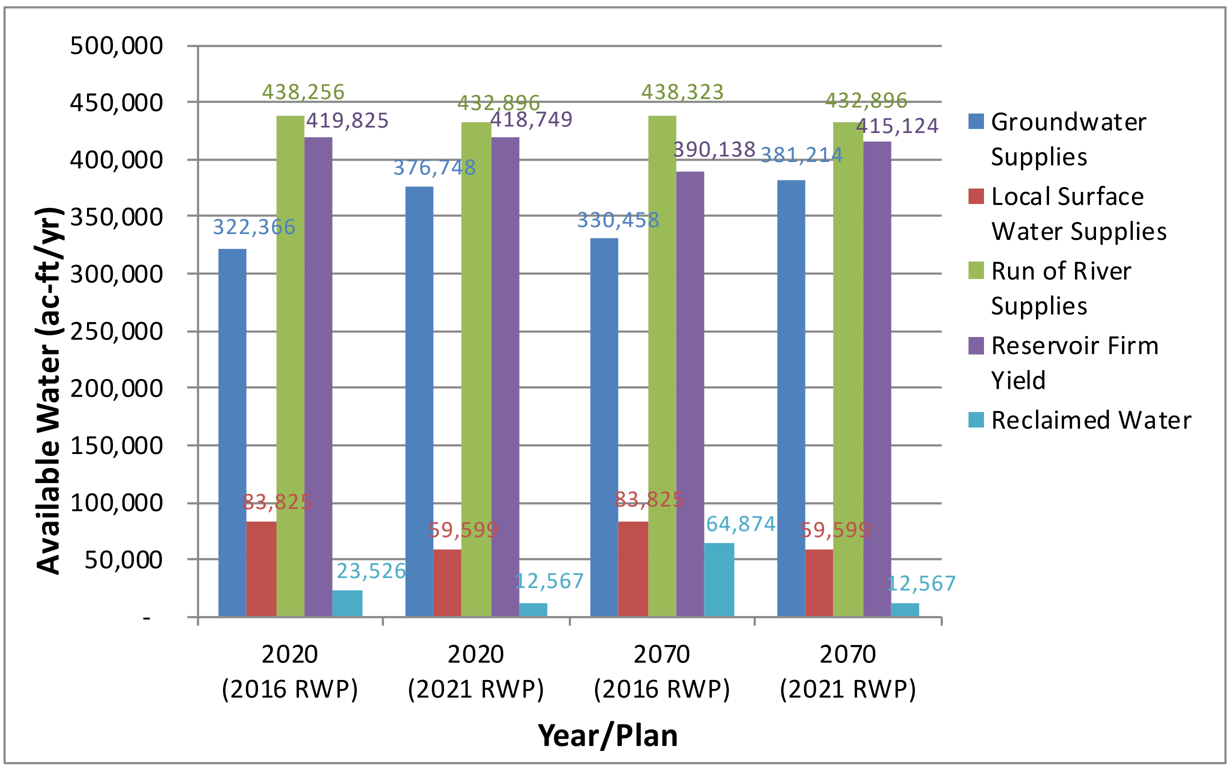
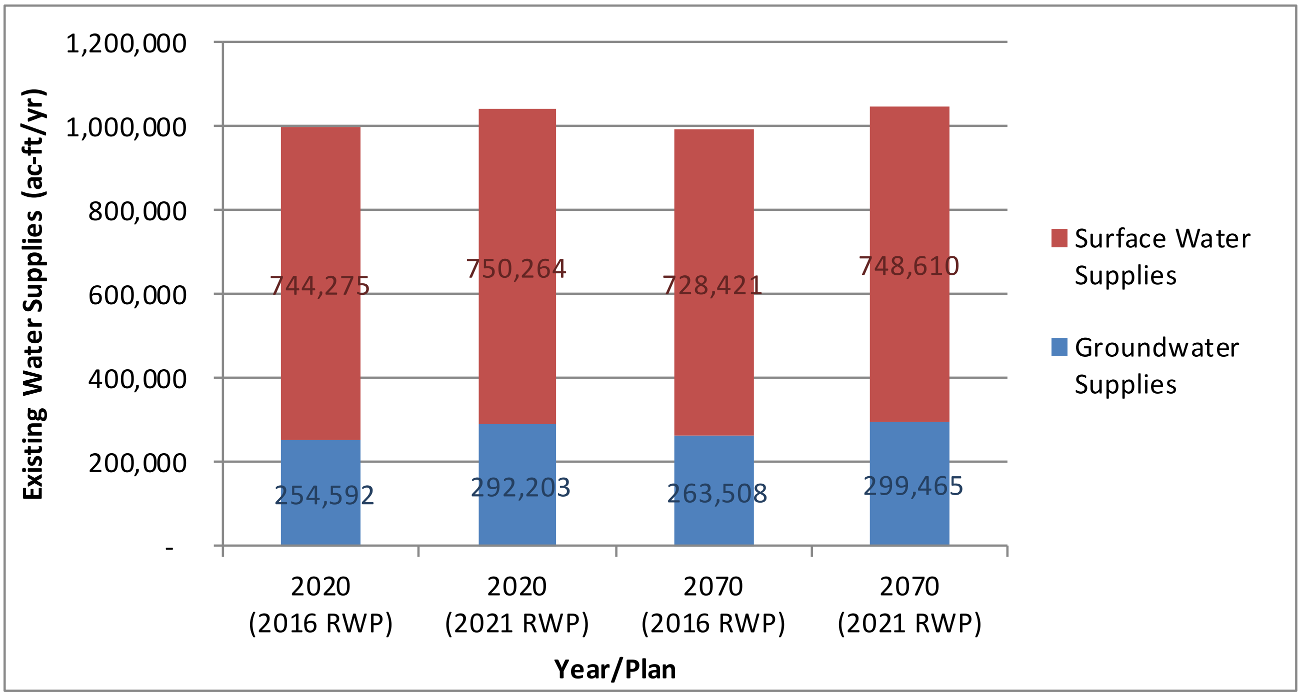


Figure 11.2 provides a comparison of the existing surface water and groundwater supplies in Region K for the 2016 Region K Plan and 2021 Region K Plan, shown for the 2020 and 2070 planning decades. Existing water supplies are those that can be currently accessed by Water User Groups, both physically and legally. Existing water supplies are generally less than the available source volumes. Total existing water supplies increase in the 2021 Region K Plan as compared to the 2016 Region K Plan. In the 2016 Region K Plan, the total existing water supplies (surface water plus groundwater) are 998,867 ac-ft/yr in 2020 and 991,929 ac-ft/yr in 2070. In the 2021 Region K Plan, the total existing water supplies are 1,042,067 ac-ft/yr in 2020 and 1,048,075 ac-ft/yr in 2070.

Figure 11.2: Comparison of Existing Water Supplies for 2020 and 2070



11.2.5 Water Needs

Water needs in the region are determined by comparing the demand projections to the existing supplies. The 2070 water needs for Region K have decreased by approximately 192,000 ac-ft/yr in the 2021 Region K Plan, as compared to the 2016 Region K Plan. This decrease in needs is due to a combination of decreased total demands and increased total existing supplies (source availability) for Region K, as described in Sections 11.2.2 and 11.2.4 above. *Table 11.5* shows a comparison of the 2070 needs by county for the 2016 Region K Plan and the 2021 Region K Plan. The needs have decreased due in part to reductions in water demands for Irrigation, Manufacturing, and Steam-Electric demands in certain counties.

Table 11.5: Comparison of Water Needs by County for 2020 and 2070

County	2070 Water Needs from 2016 RWP (ac-ft/yr)	2070 Water Needs from 2021 RWP (ac-ft/yr)	Comparison (Positive = Increased Need) (ac-ft/yr)
Bastrop	47,187	37,368	-9,819
Blanco	230	82	-148
Burnet	10,457	9,033	-1,424
Colorado	38,205	37,433	-772
Fayette	8,750	5,246	-3,504
Gillespie	848	0	-848
Hays	23,294	18,990	-4,304
Llano	629	642	13
Matagorda	164,999	110,277	-54,722
Mills	583	1,756	1,173
San Saba	152	0	-152
Travis	134,438	43,787	-86,851
Wharton	82,532	53,386	-29,146
Williamson	0	785	785
Total (Region K)	**512,304**	**320,685**	**-189,719**

The 2070 firm water needs for Major Water providers (LCRA and Austin) in the region have changed between the 2016 Region K Plan and the 2021 Region K Plan, as shown in *Table 11.6* below. The decrease in needs for LCRA was related to a reduced sedimentation impact in the firm yield of the Highland Lakes and to the construction of the Arbuckle Reservoir. The decrease in needs for Austin was related in part to a decrease in demands, particularly a decrease in reported manufacturing demands. For the 2021 Plan, the West Travis County Public Utility Agency is also a Major Water Provider, but was not included in that category last cycle, so no comparison has been included.

Table 11.6: Comparison of 2070 Firm Water Surplus/Needs by Major Water Provider

Major Water Provider	2070 Firm Water Surplus/Need from 2016 RWP (ac-ft/yr)	2070 Firm Water Surplus/Need from 2021 RWP (ac-ft/yr)
LCRA	(8,163)	8,127
Austin	(87,441)	(8,770)

11.2.6 Recommended Water Management Strategies

As strategies have been implemented or determined infeasible since the previous planning cycle, the water management strategies identified in the 2021 Region K Plan have key differences from the identified water management strategies in the 2016 Region K Plan. The next two sections identify only the differences between the two plans.

There are several recommended water management strategies that were included in the 2016 Region K Plan but are no longer recommended in the 2021 Region K Plan. Those strategies include the following:

- Lake Long Enhanced Storage
- LCRA Lane City Reservoir
- LCRA Groundwater Supply for FPP (on-site and off-site)
- Expand Local Use of Groundwater Supplies – Hickory Aquifer
- Expand Local Use of Groundwater Supplies – Marble Falls Aquifer
- Development of New Groundwater Supplies – Carrizo-Wilcox Aquifer

There are many recommended water management strategies in the 2021 Region K Plan that are new and were not included as Recommended in the 2016 Region K Plan. They include the following:

- Import Return Flows from Williamson County (Alternative in 2016 Plan)
- Baylor Creek Reservoir (Alternative in 2016 Plan)
- LCRA Aquifer Storage and Recovery in Carrizo-Wilcox (Alternative in 2016 Plan)
- LCRA Enhanced Recharge (Alternative in 2016 Plan)
- Austin (COA) Brackish Groundwater Desalination (Alternative in 2016 Plan)
- Austin Onsite and Community-Scale Rainwater and Stormwater Harvesting (expansion of strategy in 2016 Plan)
- Austin Blackwater and Greywater Reuse (expansion of strategies from 2016 Plan)
- Austin Off-Channel Reservoir and Evaporation Suppression (modification and expansion of strategy in 2016 Plan)
- Direct Potable Reuse (Alternative in 2016 Plan - Buda; Recommended now for multiple WUGs)
- Water Supply Infrastructure Development and Expansion
- Expand Local Use of Groundwater Supplies – Yegua-Jackson Aquifer
- Development of New Groundwater Supplies – Ellenburger-San Saba Aquifer
- Development of New Groundwater Supplies – Marble Falls Aquifer
- Development of New Groundwater Supplies – Sparta Aquifer
- Development of New Groundwater Supplies – Yegua-Jackson Aquifer
- Wharton Water Supply Strategy

11.2.7 Alternative Water Management Strategies

There are several alternative water management strategies that were included in the 2016 Region K Plan but are no longer included as alternative strategies in the 2021 Region K Plan. Those strategies include the following:

- Groundwater Importation – Carrizo-Wilcox Aquifer to LCRA System (Considered in 2021 Plan)
- Import Return Flows from Williamson County (moved to Recommended in 2021 Plan)
- Baylor Creek Reservoir (moved to Recommended in 2021 Plan)
- LCRA Aquifer Storage and Recovery in Carrizo-Wilcox (moved to Recommended in 2021 Plan)
- LCRA Enhanced Recharge (moved to Recommended in 2021 Plan)
- COA Brackish Groundwater Desalination (moved to Recommended in 2021 Plan)
- COA Reclaimed Water Bank Infiltration to Colorado Alluvium (removed from consideration)
- HCPUA Pipeline (Alternative version removed; Recommended version kept – renamed ARWA Pipeline)
- Direct Potable Reuse (moved to Recommended in 2021 Plan)

There are also a couple of alternative water management strategies in the 2021 Region K Plan that are new and were not in the 2016 Region K Plan. They include the following:

- Expand Use of Carrizo-Wilcox Aquifer (Bastrop County)
- LCRA Expand Use of Groundwater in Bastrop County

11.2.8 Region's Progress Towards "Regionalization"

HB 807 requires that the regional water plan shall "assess the progress of the RWPA in encouraging cooperation between water user groups for the purpose of achieving economies of scale and otherwise incentivizing strategies that benefit the entire region."

The 2021 Region K Water Plan has recommended a number of water management strategies that encourage cooperation between water user groups and have the ability to benefit a large part of the region. In addition, the Lane City off-channel reservoir (now known as the Arbuckle Reservoir) was recommended in the 2016 Region K Water Plan and has since been constructed. This reservoir has the ability to benefit a large portion of the region by capturing additional flood flows that would previously have been lost downstream and allowing release of them when needed, and by reducing the need to release stored water from lakes Buchanan and Travis to meet downstream needs.

Recommended strategies in the 2021 Region K Water Plan that make progress towards "regionalization" include other proposed LCRA off-channel reservoirs, importing return flows from Williamson County, the Burnet County Regional Projects (Buena Vista, East Lake Buchanan, and Marble Falls), the proposed Bastrop Regional Project (future surface water infrastructure for Aqua WSC, Bastrop, and Bastrop County WCID 1), and the Hays County Pipeline project.

APPENDIX 11A

IMPLEMENTATION SURVEY TEMPLATE FOR 2016 REGION K WATER PLAN PROJECTS

Table 11A.1 - Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Table 11A.2 - Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Table 11A-1: Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	BUENA VISTA REGIONAL PROJECT	2020	PROJECT SPONSOR(S): BERTRAM; BURNET; COUNTY-OTHER (BURNET)	RECOMMENDED WMS PROJECT	2258	No			Not implemented	The City is adding additional sources to the Water Plan and not using this strategy					
K	CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2135	Yes	2018 - AWFP approved by City Council	Began in 2019	Sponsor has taken official action to initiate project		TBD	0	$250,000	$367 million	
K	CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2148	Yes	2018 - AWFP approved by City Council	2040 - target for completion	Not implemented	Too soon	TBD	0	$250,000	Capital costs included as part of the COA Indirect Potable Reuse through Lady Bird Lake strategy	
K	CITY OF AUSTIN - DIRECT REUSE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2132	Yes	1974	Ongoing	Currently operating		TBD	4,500 AFY	Approx $119M since 1974	$422M through 2115	
K	CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2152	Yes	2018 - AWFP approved by City Council	2040 - target for completion	Not implemented	Too soon	TBD	0	$750,000	$91M	
K	CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	2020	WMS SUPPLY RECIPIENT: AUSTIN	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	33371	Yes	2018 - AWFP approved by City Council	As necessary to respond to drought	Not implemented	Would be implemented in response to drought	TBD	0	$0	No capital costs; O&M costs only	
K	CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2146	No			Not implemented	Project is no longer being considered as a strategy					
K	CITY OF AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2144	Yes	2018	Ongoing	Sponsor has taken official action to initiate project		TBD	0	$0	$11M	
K	CITY OF AUSTIN - OTHER REUSE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2147	Yes	2018 - AWFP approved by City Council	Ongoing	Currently operating		TBD	450 AFY	Ongoing	This strategy was broken into several individual strategies for the 2021 planning cycle; costs are being developed for these strategies	
K	CITY OF AUSTIN - RAINWATER HARVESTING	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2145	Yes	Rainwater harvesting rebates have been in place since 2009.	Rainwater harvesting rebates are currently in place.	Currently operating		Not applicable	3.55 ac-ft total (2014-2019	$723k (Funds expended t	TBD; generally to be borne by development with potential for cost offsets through utility incentives	
K	CITY OF AUSTIN CONSERVATION	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2131	Yes	Ongoing - various actions on multiple conservation strategies	Ongoing	Currently operating		Not applicable	Varies annually (TBD)	Varies annually (TBD)	Varies annually (TBD)	
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: AUSTIN	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32320	Yes	Ongoing	Ongoing	Permit application submitted/pending	In process	TBD	0	n/a	TBD	
K	DEVELOPMENT OF NEW HICKORY AQUIFER SUPPLIES - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	1766										
K	DIRECT REUSE - BUDA	2020	PROJECT SPONSOR(S): BUDA	RECOMMENDED WMS PROJECT	2321	Yes			Currently operating			18 AFY			2017
K	DIRECT REUSE - HORSESHOE BAY	2020	WMS SUPPLY RECIPIENT: HORSESHOE BAY	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	33297	Yes	2017		Currently operating	Two phase project	n/a	583 AFY	$70,000	$1,070,000	2017
K	DIRECT REUSE - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	2322	No			Not implemented	Financing	Funding				

Table 11A-1: Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	DIRECT REUSE - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	2323	Yes	2008	2009	Currently operating	n/a	n/a	n/a	n/a	n/a	2014
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AQUA WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10389	No			Not implemented	Too soon	Trigger mechanism not met				
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AUSTIN	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10645	Yes	2016 (most recent DCP)	Ongoing	Currently operating		TBD	Variable depending on drought restriction stage	Funding for outreach and enforcement as needed	Funded through operating budget	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BAY CITY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10987	Yes	2019	5-Nov-19	All phases fully implemented		n/a		$0	$0	2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BERTRAM	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10494	Yes	2019	15-Oct-19	Currently operating		n/a	n/a	$3,500	$3,500	2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BUDA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10653	Yes	2012; 2019		All phases fully implemented						2017
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: CREEDMOOR-MAHA WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10437	Yes	2018	2019	Currently operating			Plan is in place. Will be implemented during drought.			2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10670										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FAYETTE WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10593	Yes	2017	2023	Feasibility study ongoing		Access to funding		$8,000	$2,100,000	2023
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: HORSESHOE BAY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10525	Yes	2015	16-Jan-15	Sponsor has taken official action to initiate project	Limit Customer landscape irrigation to twice weekly only with limited hours.	n/a	300 AFY	$0	$0	2017
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LLANO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10715	Yes	2019	May-19	Currently operating						2020
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANVILLE WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10846	Yes	2016								
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PFLUGERVILLE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10862	Yes	2006		All phases fully implemented	n/a	n/a	n/a	n/a	n/a	2014
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SMITHVILLE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10460	Yes	2000	Immediate	All phases fully implemented		Not applicable	4000 AFY	$500,000	$44,745	
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	1668	Yes	2018	2019	Currently operating						
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	1673	Yes	2019	Permit apps were submitted Feb 2018	Permit application submitted/pending		Permitting process	0 AFY	excess of $3M		2023
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	RECOMMENDED WMS PROJECT	1705	Yes	2019	2021	Feasibility study ongoing	Evaluating costs and options	Permitting process; Groundwater rights; financing	366.5 AFY	$63,000	$16,345,000	2022
K	LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2129	No			Feasibility study ongoing	No suitable water rights opportunities have arisen		0 AFY	$0	$145/AF	
K	LCRA - CONTRACT AMENDMENTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2438	No			Feasibility study ongoing	No customers listed in the 2016 RWP have yet requested contract amendments		0 AFY	$0	$151/AF	
K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2018	Yes	2019	5/22/2019	Sponsor has taken official action to initiate project			4,500	$200,000 for incentives, no internal labor costs		2019
K	LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2128	No			Feasibility study ongoing	LCRA is in the process of obtaining permit	Permitting process	0 AFY	$0	$1,446/AF	2021
K	LCRA - GROUNDWATER SUPPLY FOR FPP (OFF-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2233	No									
K	LCRA - GROUNDWATER SUPPLY FOR FPP (ON-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2019	No									
K	LCRA - LANE CITY OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2090	Yes		2019	All phases fully implemented						
K	LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2127	No			Feasibility study ongoing	Too soon	Lack of need	0 AFY	in excess of $500,000	$512,792,000	
K	LCRA - NEW LCRA CONTRACTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2439	No			Acquisition and design phase	Too soon	Not applicable	0 AFY	$0	$151/AF	

Table 11A-1: Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	MUNICIPAL CONSERVATION - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	1808	Yes	2006	AMR completed 2012	Currently operating						
K	MUNICIPAL CONSERVATION - BAY CITY	2020	PROJECT SPONSOR(S): BAY CITY	RECOMMENDED WMS PROJECT	1919	Yes	2019	5-Nov-19	All phases fully implemented		n/a		$300/yr	$0	2019
K	MUNICIPAL CONSERVATION - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	RECOMMENDED WMS PROJECT	1872	Yes	2019	2020	Currently operating		n/a	12 AFY	$12,300	$12,300	2020
K	MUNICIPAL CONSERVATION - BUDA	2020	PROJECT SPONSOR(S): BUDA	RECOMMENDED WMS PROJECT	1908	Yes	2015	2019	Currently operating				$2,622,393		2017
K	MUNICIPAL CONSERVATION - CEDAR PARK	2020	PROJECT SPONSOR(S): CEDAR PARK	RECOMMENDED WMS PROJECT	1948	Yes	2016	9/12/16 - full AMI implementation project	All phases fully implemented				$5,257,758	$5,257,758	2017
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS WSC	RECOMMENDED WMS PROJECT	1912										
K	MUNICIPAL CONSERVATION - HORSESHOE BAY	2020	PROJECT SPONSOR(S): HORSESHOE BAY	RECOMMENDED WMS PROJECT	1886	Yes	2015		All phases fully implemented		n/a	9.97 AFY	$80	Ongoing Leak detection surveys - $20-$30 annually	2017
K	MUNICIPAL CONSERVATION - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	1917	Yes	2019	May-19	All phases fully implemented						
K	MUNICIPAL CONSERVATION - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	1959	Yes		2021	Feasibility study ongoing	Awaiting approval in future budget proposal.	Access to funding	n/a	n/a	n/a	2022
K	MUNICIPAL CONSERVATION - SAN SABA	2020	PROJECT SPONSOR(S): SAN SABA	RECOMMENDED WMS PROJECT	1922	Yes	2013		Not implemented	Implementation is currently not required	Not applicable				2016
K	MUNICIPAL CONSERVATION - SMITHVILLE	2020	PROJECT SPONSOR(S): SMITHVILLE	RECOMMENDED WMS PROJECT	1865	Yes	2015	2016	All phases fully implemented		Not applicable	n/a		$2.3M AMI upgrade	2017
K	URGENT WATER LOSS REDUCTION PROJECT - CMWSC	2020	PROJECT SPONSOR(S): CREEDMOOR-MAHA WSC	RECOMMENDED WMS PROJECT	2869	Yes	2018	2020-2021	Feasibility study ongoing		n/a	1,130 AFY		$9,335,000	
K	BS/EACD EDWARDS / MIDDLE TRINITY ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); MINING (HAYS); MOUNTAIN CITY; SUNSET VALLEY	RECOMMENDED WMS PROJECT	2238	Yes	Approved in FY 2017-2018 Budget	In progress, complete in 2020	Under construction			2020 - 150 AFY; 2021 - 300 AFY	$1,896,000	$2,500,000	2020
K	BS/EACD SALINE EDWARDS ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); CREEDMOOR-MAHA WSC	RECOMMENDED WMS PROJECT	2241	No			Not implemented	Too soon; financing; permitting; environmental	Project viability, cost. This project might be viable by Desalinating Saline Edwards and having an ASR component				
K	WATER PURCHASE	2030	WMS SELLER: DRIPPING SPRINGS WSC; WMS SUPPLY RECIPIENT: DRIPPING SPRINGS	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32528										
K	EXPANSION OF EDWARDS (BFZ) AQUIFER SUPPLIES - PFLUGERVILLE	2040	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	1708	No				n/a	n/a	n/a	n/a	n/a	
K	NEW SURFACE WATER INFRASTRUCTURE - AQUA WSC	2040	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	2317	No			Not implemented	Too soon					
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANVILLE WSC	2050	PROJECT SPONSOR(S): MANVILLE WSC	RECOMMENDED WMS PROJECT	1736	No			Not implemented	Too soon					
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - SMITHVILLE	2070	PROJECT SPONSOR(S): SMITHVILLE	RECOMMENDED WMS PROJECT	2214	No			Not implemented	No need. We are permitted for 4000 acre-ft and only use 850 acre-ft / year	Not applicable				

Table 11A-1: Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	BUENA VISTA REGIONAL PROJECT	2020	PROJECT SPONSOR(S): BERTRAM; BURNET; COUNTY-OTHER (BURNET)							No			
K	CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	2020	PROJECT SPONSOR(S): AUSTIN	Yes	90,000 AFY	TBD		Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No		Notes: (1) Sponsor is in consultant procurement process (2) Project is anticipated to be online by 2040, with further expansions planned in the future; (2) project is anticipated to continue expanding up to 2115 as needed.
K	CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	No	3,000 AFY		2040	Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Notes: (1) Per Austin's Water Forward Plan, this strategy is targeted to be online by 2040
K	CITY OF AUSTIN - DIRECT REUSE	2020	PROJECT SPONSOR(S): AUSTIN	Yes	54,600 AFY	$422M through 2115		Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Notes: (1) Direct Reuse refers to centralized direct non-potable reuse, or purple pipe systems; (2) this strategy is currently operating, but will continue to expand; (3) the planned maximum capacity is through the year 2115; future plans will continue to update planning horizon.
K	CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	No	20,000 AFY	$91M	2040	Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Note: (1) Project is planned to be online by 2040; (2) project would only be used in drought conditions when combined storage in the Highland Lakes falls below 400,000 AF.
K	CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	2020	WMS SUPPLY RECIPIENT: AUSTIN	No	2,500 AFY	No capital costs; O&M costs only		Other	Cash - revenues	Yes	No	No	Note: (1) Project would come online as necessary to respond to drought conditions; (2) project would be used during non-peak months (Oct.-May) and after combined storage in the Highland Lakes is below 600,000 AF.
K	CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	2020	PROJECT SPONSOR(S): AUSTIN							No			
K	CITY OF AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	2020	PROJECT SPONSOR(S): AUSTIN	Yes	3,000 AFY	Pending earlier phases		Other	Bonds	Yes	No	No	
K	CITY OF AUSTIN - OTHER REUSE	2020	PROJECT SPONSOR(S): AUSTIN	Yes	64,350 AFY in 2115	This strategy was broken into several individual strategies for the 2021 planning cycle; costs are being developed for these strategies		Other	Developers/Program Participants; TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Note: (1) Project implementation is ongoing; (2) Water Forward plans for implementation to continue through 2115, with corresponding capacity increases.
K	CITY OF AUSTIN - RAINWATER HARVESTING	2020	PROJECT SPONSOR(S): AUSTIN	Yes	9,250 ac-ft/yr	TBD; generally to be borne by development with pot		Other	TBD; generally funded by development with potential for cost offsets through utility incentives	Yes	No	No	Notes: (1) This strategy has been re-evaluated as part of the 2018 Water Forward Plan; (2) this strategy is currently operating, but will continue to expand; (3) the planned maximum capacity is through the year 2115; future plans will continue to update planning horizon.
K	CITY OF AUSTIN CONSERVATION	2020	PROJECT SPONSOR(S): AUSTIN	Yes	37,000 AFY	$41M		Other	Combination of funding including TWDB SWIFT and Utility O&M and CIP	Yes	No	No	conservation program since the 1980s and continues to advance the program, (2) Austin's Water Forward Plan includes implementation of conservation strategies through the full planning horizon to 2115
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: AUSTIN						n/a	Yes	No	No	Notes: Austin and LCRA have a pending joint water right permit application at TCEQ for bed and banks reuse of Austin's return flows. As part of the regional planning process, prior to the issuance of the permit and development of a project, Austin's projected return flows are a water management strategy for downstream uses.
K	DEVELOPMENT OF NEW HICKORY AQUIFER SUPPLIES - LLANO	2020	PROJECT SPONSOR(S): LLANO										
K	DIRECT REUSE - BUDA	2020	PROJECT SPONSOR(S): BUDA	Yes	1680 AFY		2050			Yes	No		Effluent forcemain to Sunfield MUD, complete by 2022. Sunfield can take up to 1120ac-ft/yr for use in the MUD. Feasibility study underway to maximize current system use and potentially add additional storage capacity.
K	DIRECT REUSE - HORSESHOE BAY	2020	WMS SUPPLY RECIPIENT: HORSESHOE BAY	Yes	1,344	$1,070,000	2050	Market	Private funds from golf course	Yes	No	No	
K	DIRECT REUSE - LLANO	2020	PROJECT SPONSOR(S): LLANO	No						Yes			

Table 11A-1: Summary of TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	DIRECT REUSE - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	Yes	n/a	n/a	2030		n/a	No	No	No	Water reuse for irrigation already in effect for a nearby county park, with a tentative plan to distribute reused water to all city parks within the next 10 years. Any project costs or funds expended to date are currently not available for input.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AQUA WSC								No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AUSTIN	No				Other	Revenues from customers		No	No	Project is currently online and anticipated to remain online throught the planning horizon.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BAY CITY	No				Other	Bay City - Utility Enterprise Fund	Yes	No	No	DCP was reviewed/updated & adopted by City Council on 11/5/2019. Since plan inception in 1999 the City of Bay City has not faced drought conditions or a water demand that require implementation of drought trigger responses.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BERTRAM	No			2040	TWDB - Other	DWSRF	Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BUDA							Yes	No		
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: CREEDMOOR-MAHA WSC	No			2025	TWDB - Other		Yes	No	No	Drought contingency plan has been adopted by the WSC; steps will be implemented once triggers are reached. While plan will not create new water, it will postpone need to find new sources/supply.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS WSC										The DSWSC Drought Contingency Plan is currently being revised with help from the LCRA. DSWSC staff will be presenting a draft copy to the Board of Directors for their review and approval.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FAYETTE WSC	No			2025	Commercial/Bank loan		Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: HORSESHOE BAY					Other		Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LLANO	No						Yes			
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANVILLE WSC										During the most recent drought of record in 2011, Manville implemented stage II, twice a week outside watering water restrictions on July 1, 2011.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PFLUGERVILLE	Yes	n/a	n/a	2070		n/a	Yes	No	No	"Year Project is online" is actually 2006 but year not available in drop-down option, used earliest provided. Any project costs or funds expended to date are currently not available for input.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SMITHVILLE	No			2070	Other	Utility Fund	Yes	No	Potentially, but no technical flood analysis performed	
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC							Yes			Added 1200 gpm Behrend Well to McDade Well Field
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	25,000 AFY	$46,629,000		Other	Any combination of funding sources listed.	Yes	No	No	Year project reaches maximum capacity will depend on demand
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	Yes	2,000 AFY	$16,345,000		TWDB - Other	DWSRF	Yes	No	No	
K	LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	25,000	$125,000		Other	Any combination of funding sources listed.	Yes	No	No	Water rights will be acquired as they become available at a suitable cost.
K	LCRA - CONTRACT AMENDMENTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	39,466	$151/AF		Other	Customer project revenue	Yes	No	No	Project will come online as needed by customers
K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY		20,000		2050	Other	General revenue from water rates	Yes	No	No	This references the 2019 LCRA WCP, which is updated every five years.
K	LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No				Other	Any combination of funding sources listed.	Yes	No	Potentially, but no technical flood analysis performed	If an existing OCR site is chosen, and permitting is successful, then project could be online before 2030.
K	LCRA - GROUNDWATER SUPPLY FOR FPP (OFF-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY							No			LCRA is no longer recommending this alternative
K	LCRA - GROUNDWATER SUPPLY FOR FPP (ON-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY							No			LCRA is no longer recommending this alternative
K	LCRA - LANE CITY OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY										
K	LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No			2030	Other	Any combination of funding sources listed.	Yes			
K	LCRA - NEW LCRA CONTRACTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No						Yes	No	No	New contracts will be entered as needed.

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	MUNICIPAL CONSERVATION - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC									No	
K	MUNICIPAL CONSERVATION - BAY CITY	2020	PROJECT SPONSOR(S): BAY CITY	No				Other	Bay City - Utility Enterprise Fund	No	No	No	Council on 11/5/2019. Water saving target achieved in 2019 for the residential class via capital measures (replace aging waterlines & install AMI) & outreach/education. Future efforts will target commercial & institutional classes.
K	MUNICIPAL CONSERVATION - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	Yes	80 AFY	$130,000	2060	Other	Rates and Fees	Yes	No	No	
K	MUNICIPAL CONSERVATION - BUDA	2020	PROJECT SPONSOR(S): BUDA				2020	Commercial/Bank loan		Yes	No		AMI water savings still being tracked. The City also had a leak detection survey performed on part of the system, and will continue with more sections in the future along with other programs outlined in the WCP updated in 2019.
K	MUNICIPAL CONSERVATION - CEDAR PARK	2020	PROJECT SPONSOR(S): CEDAR PARK	No			2040	Other	Self pay and Bonds	Yes	No	No	
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS WSC										DSWSC staff is currently revising and updating the WCP with help from the LCRA. A draft copy is planned to be reviewed and approved by the DSWSC Board of Directors.
K	MUNICIPAL CONSERVATION - HORSESHOE BAY	2020	PROJECT SPONSOR(S): HORSESHOE BAY	No			2040	Other	Utility rates of customers	Yes	No	No	
K	MUNICIPAL CONSERVATION - LLANO	2020	PROJECT SPONSOR(S): LLANO							Yes			
K	MUNICIPAL CONSERVATION - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE		n/a	n/a	2025		n/a	Yes	No	No	Advanced Metering Infrastructure - not yet implemented. Any project costs or funds expended to date are currently not available for input.
K	MUNICIPAL CONSERVATION - SAN SABA	2020	PROJECT SPONSOR(S): SAN SABA										
K	MUNICIPAL CONSERVATION - SMITHVILLE	2020	PROJECT SPONSOR(S): SMITHVILLE	No			2070	Other	Qualified Energy Conservation Bonds	Yes	No	Yes, flood risk study confirmed benefits	
K	URGENT WATER LOSS REDUCTION PROJECT - CMWSC	2020	PROJECT SPONSOR(S): CREEDMOOR-MAHA WSC	No			2025	TWDB - Other			No	No	
K	BS/EACD EDWARDS / MIDDLE TRINITY ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); MINING (HAYS); MOUNTAIN CITY; SUNSET VALLEY	Yes	~600 AFY	$7,750,000	2030	Other	Current project is funded from Certificate of Obligation Utility Bond, options being explored for future phases	Yes	No	No	
K	BS/EACD SALINE EDWARDS ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); CREEDMOOR-MAHA WSC							Yes	No	No	Storing fresh Edwards in the Saline Edwards is not an option Buda will pursue since we can store in the Trinity Aquifer. A feasibility study desalinating Saline Edwards and having an ASR component to keep plant size efficient is a possible option for Buda, and I think the original intent of this WMS.
K	WATER PURCHASE	2030	WMS SELLER: DRIPPING SPRINGS WSC; WMS SUPPLY RECIPIENT: DRIPPING SPRINGS										Currently there is no purchase contract with the City of Dripping Springs and DSWSC.
K	EXPANSION OF EDWARDS (BFZ) AQUIFER SUPPLIES - PFLUGERVILLE	2040	PROJECT SPONSOR(S): PFLUGERVILLE		n/a	n/a				Yes			There are currently no expansion plans for Groundwater supplies.
K	NEW SURFACE WATER INFRASTRUCTURE - AQUA WSC	2040	PROJECT SPONSOR(S): AQUA WSC										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANVILLE WSC	2050	PROJECT SPONSOR(S): MANVILLE WSC										Current not applicable as the MWSC plan is for water expansion in 2050.
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - SMITHVILLE	2070	PROJECT SPONSOR(S): SMITHVILLE										

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	ALTERNATE CANAL DELIVERY - STPNOC	2020	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (MATAGORDA)	RECOMMENDED WMS PROJECT	2324										
K	BLEND BRACKISH SURFACE WATER IN STPNOC RESERVOIR	2020	WMS SUPPLY RECIPIENT: STEAM ELECTRIC POWER, MATAGORDA	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	39923										
K	BRUSH CONTROL	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO); COUNTY-OTHER (BURNET); COUNTY-OTHER (GILLESPIE); COUNTY-OTHER (HAYS); COUNTY-OTHER (LLANO); COUNTY-OTHER (MILLS); COUNTY-OTHER (SAN SABA); COUNTY-OTHER (TRAVIS)	RECOMMENDED WMS PROJECT	2255										
K	BUENA VISTA REGIONAL PROJECT	2020	PROJECT SPONSOR(S): BERTRAM; BURNET; COUNTY-OTHER (BURNET)	RECOMMENDED WMS PROJECT	2258	No			Not implemented	The City is adding additional sources to the Water Plan and not using this strategy					
K	CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2135	Yes	2018 - AWFP approved by City Council	Began in 2019	Sponsor has taken official action to initiate project		TBD	0	$250,000	$367 million	
K	CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2148	Yes	2018 - AWFP approved by City Council	2040 - target for completion	Not implemented	Too soon	TBD	0	$250,000	Capital costs included as part of the COA Indirect Potable Reuse through Lady Bird Lake strategy	
K	CITY OF AUSTIN - DIRECT REUSE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2132	Yes	1974	Ongoing	Currently operating		TBD	4,500 AFY	Approx $119M since 197	$422M through 2115	
K	CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2152	Yes	2018 - AWFP approved by City Council	2040 - target for completion	Not implemented	Too soon	TBD	0	$750,000	$91M	
K	CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	2020	WMS SUPPLY RECIPIENT: AUSTIN	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	33371	Yes	2018 - AWFP approved by City Council	As necessary to respond to drought	Not implemented	Would be implemented in response to drought	TBD	0	$0	No capital costs; O&M costs only	
K	CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2146	No			Not implemented	Project is no longer being considered as a strategy					
K	CITY OF AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2144	Yes	2018	Ongoing	Sponsor has taken official action to initiate project		TBD	0	$0	$11M	
K	CITY OF AUSTIN - OTHER REUSE	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2147	Yes	2018 - AWFP approved by City Council	Ongoing	Currently operating		TBD	450 AFY	Ongoing	This strategy was broken into several individual strategies for the 2021 planning cycle; costs are being developed for these strategies	
K	CITY OF AUSTIN - RAINWATER HARVESTING	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2145	Yes	Rainwater harvesting rebates have been in place since 2009.	Rainwater harvesting rebates are currently in place.	Currently operating		Not applicable	3.55 ac-ft total (2014-2019	$723k (Funds expended t	TBD; generally to be borne by development with potential for cost offsets through utility incentives	
K	CITY OF AUSTIN CONSERVATION	2020	PROJECT SPONSOR(S): AUSTIN	RECOMMENDED WMS PROJECT	2131	Yes	Ongoing - various actions on multiple conservation strategies	Ongoing	Currently operating		Not applicable	Varies annually (TBD)	Varies annually (TBD)	Varies annually (TBD)	
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: AUSTIN	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32320	Yes	Ongoing	Ongoing	Permit application submitted/pending	In process	TBD	0	n/a	TBD	
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: IRRIGATION, MATAGORDA	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32384										

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: IRRIGATION, WHARTON	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32389										
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: STEAM ELECTRIC POWER, MATAGORDA	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32328										
K	DEVELOPMENT OF NEW CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP	2020	PROJECT SPONSOR(S): BASTROP	RECOMMENDED WMS PROJECT	1763										
K	DEVELOPMENT OF NEW HICKORY AQUIFER SUPPLIES - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	1766										
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - BASTROP COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (BASTROP)	RECOMMENDED WMS PROJECT	1768										
K	DIRECT REUSE - BUDA	2020	PROJECT SPONSOR(S): BUDA	RECOMMENDED WMS PROJECT	2321	Yes			Currently operating			18 AFY			2017
K	DIRECT REUSE - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA	RECOMMENDED WMS PROJECT	2320										
K	DIRECT REUSE - HORSESHOE BAY	2020	WMS SUPPLY RECIPIENT: HORSESHOE BAY	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	33297	Yes	2017		Currently operating	Two phase project	n/a	583 AFY	$70,000	$1,070,000	2017
K	DIRECT REUSE - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	2322	No			Not implemented	Financing	Funding				
K	DIRECT REUSE - MARBLE FALLS	2020	WMS SUPPLY RECIPIENT: MARBLE FALLS	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	42796										
K	DIRECT REUSE - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	2323	Yes	2008	2009	Currently operating	n/a	n/a	n/a	n/a	n/a	2014
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AQUA WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10389	No			Not implemented	Too soon	Trigger mechanism not met				
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AUSTIN	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10645	Yes	2016 (most recent DCP)	Ongoing	Currently operating		TBD	Variable depending on drought restriction stage	Funding for outreach and enforcement as needed	Funded through operating budget	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BARTON CREEK WEST WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10789										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BASTROP	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10413										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BASTROP COUNTY WCID #2	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10417										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BAY CITY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10987	Yes	2019	5-Nov-19	All phases fully implemented		n/a		$0	$0	2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BEE CAVE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10793										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BERTRAM	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10494	Yes	2019	15-Oct-19	Currently operating		n/a	n/a	$3,500	$3,500	2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BLANCO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10464										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BRIARCLIFF	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10804										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BUDA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10653	Yes	2012; 2019		All phases fully implemented						2017
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BURNET	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10498										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COLUMBUS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10550										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COTTONWOOD SHORES	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10504										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BASTROP	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10429										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BLANCO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10468										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BURNET	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10513										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, COLORADO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10555										

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, FAYETTE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10585										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, GILLESPIE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10631										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, HAYS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10660										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, LLANO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10711										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, MATAGORDA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10739										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, MILLS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10751										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, SAN SABA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10764										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, WHARTON	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10931										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: CREEDMOOR-MAHA WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10437	Yes	2018	2019	Currently operating			Plan is in place. Will be implemented during drought.			2019
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10666										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10670										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: EAGLE LAKE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10564										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: EAST BERNARD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10947										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: ELGIN	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10454										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FAYETTE WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10593	Yes	2017	2023	Feasibility study ongoing		Access to funding		$8,000	$2,100,000	2023
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FLATONIA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10602										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FREDERICKSBURG	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10641										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: GOLDTHWAITE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10757										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: GRANITE SHOALS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10521										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: HORSESHOE BAY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10525	Yes	2015	16-Jan-15	Sponsor has taken official action to initiate project	Limit Customer landscape irrigation to twice weekly only with limited hours.	n/a	300 AFY	$0	$0	2017
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, COLORADO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	9282										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, MATAGORDA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	9284										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, MILLS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	9286										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, WHARTON	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	9288										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: JOHNSON CITY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10490										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: JONESTOWN	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10811										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: KINGSLAND WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10532										

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LA GRANGE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10608										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LAGO VISTA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10815										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LAKEWAY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10820										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LLANO	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10715	Yes	2019	May-19	Currently operating						2020
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LOOP 360 WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10832										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LOST CREEK MUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10836										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANOR	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10842										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANVILLE WSC	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10846	Yes	2016								
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MARBLE FALLS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10541										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MEADOWLAKES	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10546										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: NORTH AUSTIN MUD #1	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10852										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: NORTHTOWN MUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10858										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PALACIOS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10747										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PFLUGERVILLE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10862	Yes	2006		All phases fully implemented	n/a	n/a	n/a	n/a	n/a	2014
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: POINT VENTURE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10868										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: ROLLINGWOOD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10872										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SAN SABA	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10784										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SCHULENBURG	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10627										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SHADY HOLLOW MUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10876										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SMITHVILLE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10460	Yes	2000	Immediate	All phases fully implemented		Not applicable	4000 AFY	$500,000	$44,745	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SUNRISE BEACH VILLAGE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10723										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SUNSET VALLEY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10880										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: THE HILLS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10884										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY MUD #4	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10888										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #10	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10892										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #17	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10896										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #18	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10900										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #19	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10902										

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #20	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10904										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: VOLENTE	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10912										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEIMAR	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10570										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WELLS BRANCH MUD	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10916										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEST LAKE HILLS	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10926										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10700										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WHARTON	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	10961										
K	DROUGHT MANAGEMENT - MOUNTAIN CITY	2020	WUG REDUCING DEMAND: MOUNTAIN CITY	RECOMMENDED DEMAND REDUCTION STRATEGY WITHOUT WMS PROJECT	14786										
K	EAST LAKE BUCHANAN REGIONAL PROJECT	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BURNET)	RECOMMENDED WMS PROJECT	2259										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	1668	Yes	2018	2019	Currently operating						
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (BASTROP)	RECOMMENDED WMS PROJECT	1672										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BASTROP)	RECOMMENDED WMS PROJECT	1670										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - ELGIN	2020	PROJECT SPONSOR(S): ELGIN	RECOMMENDED WMS PROJECT	1671										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	1673	Yes	2019	Permit apps were submitted Feb 2018	Permit application submitted/pending		Permitting process	0 AFY	excess of $3M		2023
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	RECOMMENDED WMS PROJECT	1705	Yes	2019	2021	Feasibility study ongoing	Evaluating costs and options	Permitting process; Groundwater rights; financing	366.5 AFY	$63,000	$16,345,000	2022
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BURNET COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (BURNET)	RECOMMENDED WMS PROJECT	1706										
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - GILLESPIE COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (GILLESPIE)	RECOMMENDED WMS PROJECT	1707										
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - JOHNSON CITY	2020	PROJECT SPONSOR(S): JOHNSON CITY	RECOMMENDED WMS PROJECT	1704										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - COLORADO COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (COLORADO)	RECOMMENDED WMS PROJECT	1719										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (FAYETTE)	RECOMMENDED WMS PROJECT	1723										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (FAYETTE)	RECOMMENDED WMS PROJECT	1721										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (FAYETTE)	RECOMMENDED WMS PROJECT	1720										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA	RECOMMENDED WMS PROJECT	1722										
K	EXPANSION OF SPARTA AQUIFER SUPPLIES - FAYETTE COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (FAYETTE)	RECOMMENDED WMS PROJECT	1731										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - HAYS COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (HAYS)	RECOMMENDED WMS PROJECT	1732										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - LAKEWAY	2020	PROJECT SPONSOR(S): LAKEWAY	RECOMMENDED WMS PROJECT	1734										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MILLS COUNTY IRRIGATION	2020	PROJECT SPONSOR(S): IRRIGATION (MILLS)	RECOMMENDED WMS PROJECT	1733										
K	IRRIGATION CONSERVATION - ON FARM	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)	RECOMMENDED WMS PROJECT	1977										
K	IRRIGATION CONSERVATION - SPRINKLER	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)	RECOMMENDED WMS PROJECT	1988										
K	IRRIGATION OPERATIONS CONVEYANCE IMPROVEMENTS	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)	RECOMMENDED WMS PROJECT	1985										
K	LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2129	No			Feasibility study ongoing	No suitable water rights opportunities have arisen		0 AFY	$0	$145/AF	
K	LCRA - CONTRACT AMENDMENTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2438	No			Feasibility study ongoing	No customers listed in the 2016 RWP have yet requested contract amendments		0 AFY	$0	$151/AF	
K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2018	Yes	2019	5/22/2019	Sponsor has taken official action to initiate project			4,500	$200,000 for incentives, no internal labor costs		2019
K	LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2128	No			Feasibility study ongoing	LCRA is in the process of obtaining permit	Permitting process	0 AFY	$0	$1,446/AF	2021

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K	LCRA - GROUNDWATER SUPPLY FOR FPP (OFF-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2233	No									
K	LCRA - GROUNDWATER SUPPLY FOR FPP (ON-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2019	No									
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, COLORADO	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	16505										
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, MATAGORDA	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	16510										
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, WHARTON	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	16515										
K	LCRA - LANE CITY OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2090	Yes		2019	All phases fully implemented						
K	LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2127	No			Feasibility study ongoing	Too soon	Lack of need	0 AFY	in excess of $500,000	$512,792,000	
K	LCRA - NEW LCRA CONTRACTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2439	No			Acquisition and design phase	Too soon	Not applicable	0 AFY	$0	$151/AF	
K	MARBLE FALLS REGIONAL PROJECT	2020	PROJECT SPONSOR(S): COTTONWOOD SHORES; COUNTY-OTHER (BURNET); MARBLE FALLS	RECOMMENDED WMS PROJECT	2260										
K	MUNICIPAL CONSERVATION - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	1808	Yes	2006	AMR completed 2012	Currently operating						
K	MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	2020	PROJECT SPONSOR(S): BARTON CREEK WEST WSC	RECOMMENDED WMS PROJECT	1925										
K	MUNICIPAL CONSERVATION - BASTROP	2020	PROJECT SPONSOR(S): BASTROP	RECOMMENDED WMS PROJECT	1852										
K	MUNICIPAL CONSERVATION - BASTROP COUNTY OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BASTROP)	RECOMMENDED WMS PROJECT	1861										
K	MUNICIPAL CONSERVATION - BAY CITY	2020	PROJECT SPONSOR(S): BAY CITY	RECOMMENDED WMS PROJECT	1919	Yes	2019	5-Nov-19	All phases fully implemented		n/a		$300/yr	$0	2019
K	MUNICIPAL CONSERVATION - BEE CAVE VILLAGE	2020	PROJECT SPONSOR(S): BEE CAVE	RECOMMENDED WMS PROJECT	1929										
K	MUNICIPAL CONSERVATION - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	RECOMMENDED WMS PROJECT	1872	Yes	2019	2020	Currently operating		n/a	12 AFY	$12,300	$12,300	2020
K	MUNICIPAL CONSERVATION - BLANCO	2020	PROJECT SPONSOR(S): BLANCO	RECOMMENDED WMS PROJECT	1869										
K	MUNICIPAL CONSERVATION - BUDA	2020	PROJECT SPONSOR(S): BUDA	RECOMMENDED WMS PROJECT	1908	Yes	2015	2019	Currently operating				$2,622,393		2017
K	MUNICIPAL CONSERVATION - BURNET	2020	PROJECT SPONSOR(S): BURNET	RECOMMENDED WMS PROJECT	1876										
K	MUNICIPAL CONSERVATION - BURNET COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BURNET)	RECOMMENDED WMS PROJECT	2641										
K	MUNICIPAL CONSERVATION - CEDAR PARK	2020	PROJECT SPONSOR(S): CEDAR PARK	RECOMMENDED WMS PROJECT	1948	Yes	2016	9/12/16 - full AMI implementation project	All phases fully implemented				$5,257,758	$5,257,758	2017
K	MUNICIPAL CONSERVATION - COLUMBUS	2020	PROJECT SPONSOR(S): COLUMBUS	RECOMMENDED WMS PROJECT	1892										
K	MUNICIPAL CONSERVATION - COTTONWOOD SHORES	2020	PROJECT SPONSOR(S): COTTONWOOD SHORES	RECOMMENDED WMS PROJECT	1878										
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS	RECOMMENDED WMS PROJECT	1909										
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS WSC	RECOMMENDED WMS PROJECT	1912										
K	MUNICIPAL CONSERVATION - EAST BERNARD	2020	PROJECT SPONSOR(S): EAST BERNARD	RECOMMENDED WMS PROJECT	1975										
K	MUNICIPAL CONSERVATION - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA	RECOMMENDED WMS PROJECT	1900										
K	MUNICIPAL CONSERVATION - FREDERICKSBURG	2020	PROJECT SPONSOR(S): FREDERICKSBURG	RECOMMENDED WMS PROJECT	1906										
K	MUNICIPAL CONSERVATION - GOLDTHWAITE	2020	PROJECT SPONSOR(S): GOLDTHWAITE	RECOMMENDED WMS PROJECT	1921										
K	MUNICIPAL CONSERVATION - HORSESHOE BAY	2020	PROJECT SPONSOR(S): HORSESHOE BAY	RECOMMENDED WMS PROJECT	1886	Yes	2015		All phases fully implemented		n/a	9.97 AFY	$80	Ongoing Leak detection surveys - $20-$30 annually	2017
K	MUNICIPAL CONSERVATION - JOHNSON CITY	2020	PROJECT SPONSOR(S): JOHNSON CITY	RECOMMENDED WMS PROJECT	1871										
K	MUNICIPAL CONSERVATION - JONESTOWN	2020	PROJECT SPONSOR(S): JONESTOWN	RECOMMENDED WMS PROJECT	2213										
K	MUNICIPAL CONSERVATION - LA GRANGE	2020	PROJECT SPONSOR(S): LA GRANGE	RECOMMENDED WMS PROJECT	1902										
K	MUNICIPAL CONSERVATION - LAGO VISTA	2020	PROJECT SPONSOR(S): LAGO VISTA	RECOMMENDED WMS PROJECT	1950										
K	MUNICIPAL CONSERVATION - LAKEWAY	2020	PROJECT SPONSOR(S): LAKEWAY	RECOMMENDED WMS PROJECT	1952										
K	MUNICIPAL CONSERVATION - LLANO	2020	PROJECT SPONSOR(S): LLANO	RECOMMENDED WMS PROJECT	1917	Yes	2019	May-19	All phases fully implemented						
K	MUNICIPAL CONSERVATION - LOOP 360	2020	PROJECT SPONSOR(S): LOOP 360 WSC	RECOMMENDED WMS PROJECT	1955										
K	MUNICIPAL CONSERVATION - LOST CREEK MUD	2020	PROJECT SPONSOR(S): LOST CREEK MUD	RECOMMENDED WMS PROJECT	1956										
K	MUNICIPAL CONSERVATION - MARBLE FALLS	2020	PROJECT SPONSOR(S): MARBLE FALLS	RECOMMENDED WMS PROJECT	1887										
K	MUNICIPAL CONSERVATION - MEADOWLAKES	2020	PROJECT SPONSOR(S): MEADOWLAKES	RECOMMENDED WMS PROJECT	1889										
K	MUNICIPAL CONSERVATION - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	1959	Yes		2021	Feasibility study ongoing	Awaiting approval in future budget proposal.	Access to funding	n/a	n/a	n/a	2022
K	MUNICIPAL CONSERVATION - POINT VENTURE	2020	PROJECT SPONSOR(S): POINT VENTURE	RECOMMENDED WMS PROJECT	1961										
K	MUNICIPAL CONSERVATION - ROLLINGWOOD	2020	PROJECT SPONSOR(S): ROLLINGWOOD	RECOMMENDED WMS PROJECT	1962										
K	MUNICIPAL CONSERVATION - ROUND ROCK	2020	PROJECT SPONSOR(S): ROUND ROCK	RECOMMENDED WMS PROJECT	1963										
K	MUNICIPAL CONSERVATION - SAN SABA	2020	PROJECT SPONSOR(S): SAN SABA	RECOMMENDED WMS PROJECT	1922	Yes	2013		Not implemented	Implementation is currently not required	Not applicable				2016
K	MUNICIPAL CONSERVATION - SCHULENBURG	2020	PROJECT SPONSOR(S): SCHULENBURG	RECOMMENDED WMS PROJECT	1904										

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K	MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	2020	PROJECT SPONSOR(S): SHADY HOLLOW MUD	RECOMMENDED WMS PROJECT	1964										
K	MUNICIPAL CONSERVATION - SMITHVILLE	2020	PROJECT SPONSOR(S): SMITHVILLE	RECOMMENDED WMS PROJECT	1865	Yes	2015	2016	All phases fully implemented		Not applicable	n/a		$2.3M AMI upgrade	2017
K	MUNICIPAL CONSERVATION - SUNSET VALLEY	2020	PROJECT SPONSOR(S): SUNSET VALLEY	RECOMMENDED WMS PROJECT	1965										
K	MUNICIPAL CONSERVATION - THE HILLS	2020	PROJECT SPONSOR(S): THE HILLS	RECOMMENDED WMS PROJECT	1966										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD #4	2020	PROJECT SPONSOR(S): TRAVIS COUNTY MUD #4	RECOMMENDED WMS PROJECT	1967										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #10	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #10	RECOMMENDED WMS PROJECT	1968										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #17	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #17	RECOMMENDED WMS PROJECT	1969										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #18	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #18	RECOMMENDED WMS PROJECT	1971										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #19	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #19	RECOMMENDED WMS PROJECT	1972										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #20	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #20	RECOMMENDED WMS PROJECT	1973										
K	MUNICIPAL CONSERVATION - WEIMAR	2020	PROJECT SPONSOR(S): WEIMAR	RECOMMENDED WMS PROJECT	1895										
K	MUNICIPAL CONSERVATION - WEST LAKE HILLS	2020	PROJECT SPONSOR(S): WEST LAKE HILLS	RECOMMENDED WMS PROJECT	1974										
K	MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	2020	PROJECT SPONSOR(S): WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	RECOMMENDED WMS PROJECT	1913										
K	MUNICIPAL CONSERVATION - WHARTON	2020	PROJECT SPONSOR(S): WHARTON	RECOMMENDED WMS PROJECT	1976										
K	NEW SURFACE WATER INFRASTRUCTURE - VOLENTE	2020	PROJECT SPONSOR(S): VOLENTE	RECOMMENDED WMS PROJECT	2311										
K	URGENT WATER LOSS REDUCTION PROJECT - CMWSC	2020	PROJECT SPONSOR(S): CREEDMOOR-MAHA WSC	RECOMMENDED WMS PROJECT	2869	Yes	2018	2020-2021	Feasibility study ongoing		n/a	1,130 AFY		$9,335,000	
K	BS/EACD EDWARDS / MIDDLE TRINITY ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); MINING (HAYS); MOUNTAIN CITY; SUNSET VALLEY	RECOMMENDED WMS PROJECT	2238	Yes	Approved in FY 2017-2018 Budget	In progress, complete in 2020	Under construction			2020 - 150 AFY; 2021 - 300 AFY	$1,896,000	$2,500,000	2020
K	BS/EACD SALINE EDWARDS ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); CREEDMOOR-MAHA WSC	RECOMMENDED WMS PROJECT	2241	No			Not implemented	Too soon; financing; permitting; environmental	Project viability, cost. This project might be viable by Desalinating Saline Edwards and having an ASR component				
K	EXPANSION OF HICKORY AQUIFER SUPPLIES - BURNET COUNTY MINING	2030	PROJECT SPONSOR(S): MINING (BURNET)	RECOMMENDED WMS PROJECT	1726										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANOR	2030	PROJECT SPONSOR(S): MANOR	RECOMMENDED WMS PROJECT	1735										
K	HAYS COUNTY PIPELINE - REGION K PORTION	2030	PROJECT SPONSOR(S): WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY; COUNTY-OTHER (HAYS); DRIPPING SPRINGS WSC	RECOMMENDED WMS PROJECT	1771										
K	LCRA - PRAIRIE SITE OFF-CHANNEL RESERVOIR	2030	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	RECOMMENDED WMS PROJECT	2126										
K	NEW SURFACE WATER INFRASTRUCTURE - ELGIN	2030	PROJECT SPONSOR(S): ELGIN	RECOMMENDED WMS PROJECT	2316										
K	WATER PURCHASE	2030	WMS SELLER: DRIPPING SPRINGS WSC; WMS SUPPLY RECIPIENT: DRIPPING SPRINGS	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32528										
K	CITY OF AUSTIN RETURN FLOWS	2040	WMS SUPPLY RECIPIENT: IRRIGATION, COLORADO	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	32379										
K	DEVELOPMENT OF NEW CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY MINING	2040	PROJECT SPONSOR(S): MINING (BASTROP)	RECOMMENDED WMS PROJECT	1764										
K	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - SUNSET VALLEY	2040	PROJECT SPONSOR(S): SUNSET VALLEY	RECOMMENDED WMS PROJECT	1769										
K	DIRECT REUSE - BASTROP	2040	PROJECT SPONSOR(S): BASTROP	RECOMMENDED WMS PROJECT	2319										
K	DIRECT REUSE - BUDA	2040	WMS SELLER: BUDA; WMS SUPPLY RECIPIENT: MINING, HAYS	RECOMMENDED WMS SUPPLY WITHOUT WMS PROJECT	33305										
K	EXPANSION OF EDWARDS (BFZ) AQUIFER SUPPLIES - PFLUGERVILLE	2040	PROJECT SPONSOR(S): PFLUGERVILLE	RECOMMENDED WMS PROJECT	1708	No				n/a	n/a	n/a	n/a	n/a	
K	NEW SURFACE WATER INFRASTRUCTURE - AQUA WSC	2040	PROJECT SPONSOR(S): AQUA WSC	RECOMMENDED WMS PROJECT	2317	No			Not implemented	Too soon					
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BLANCO COUNTY-OTHER	2050	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO)	RECOMMENDED WMS PROJECT	1703										
K	EXPANSION OF HICKORY AQUIFER SUPPLIES - BLANCO COUNTY-OTHER	2050	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO)	RECOMMENDED WMS PROJECT	1725										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANVILLE WSC	2050	PROJECT SPONSOR(S): MANVILLE WSC	RECOMMENDED WMS PROJECT	1736	No			Not implemented	Too soon					
K	NEW SURFACE WATER INFRASTRUCTURE - BASTROP	2050	PROJECT SPONSOR(S): BASTROP	RECOMMENDED WMS PROJECT	2313										
K	DEVELOPMENT OF NEW GULF COAST AQUIFER SUPPLIES - WHARTON COUNTY STEAM-ELECTRIC	2060	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (WHARTON)	RECOMMENDED WMS PROJECT	1765										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY WCID #2	2060	PROJECT SPONSOR(S): BASTROP COUNTY WCID #2	RECOMMENDED WMS PROJECT	1669										
K	EXPANSION OF MARBLE FALLS AQUIFER SUPPLIES - BURNET COUNTY MINING	2060	PROJECT SPONSOR(S): MINING (BURNET)	RECOMMENDED WMS PROJECT	1729		5								
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - SMITHVILLE	2070	PROJECT SPONSOR(S): SMITHVILLE	RECOMMENDED WMS PROJECT	2214	No			Not implemented	No need. We are permitted for 4000 acre-ft and only use 850 acre-ft / year	Not applicable				

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Implementation Survey Record Type	Database ID	Has Sponsor taken affirmative vote or actions?* (TWC 16.053(h)(10))	If yes, in what year did this occur?	If yes, by what date is the action on schedule for implementation?	At what level of implementation is the project currently?*	If not implemented, why?* (When "If other, please describe" is selected, please add the descriptive text to that field)	What impediments presented to implementation?* (When "If other, please describe" is selected, please add the descriptive text to that field)	Current water supply project yield (ac-ft/yr)	Funds expended to date ($)	Project Cost ($)	Year the project is online?*
K	MUNICIPAL WATER CONSERVATION (RURAL)	2070	WUG REDUCING DEMAND: MOUNTAIN CITY	REDUCTION STRATEGY WITHOUT WMS PROJECT	14779										

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	ALTERNATE CANAL DELIVERY - STPNOC	2020	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (MATAGORDA)										
K	BLEND BRACKISH SURFACE WATER IN STPNOC RESERVOIR	2020	WMS SUPPLY RECIPIENT: STEAM ELECTRIC POWER, MATAGORDA										
K	BRUSH CONTROL	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO); COUNTY-OTHER (BURNET); COUNTY-OTHER (GILLESPIE); COUNTY-OTHER (HAYS); COUNTY-OTHER (LLANO); COUNTY-OTHER (MILLS); COUNTY-OTHER (SAN SABA); COUNTY-OTHER (TRAVIS)										
K	BUENA VISTA REGIONAL PROJECT	2020	PROJECT SPONSOR(S): BERTRAM; BURNET; COUNTY-OTHER (BURNET)							No			
K	CITY OF AUSTIN - AQUIFER STORAGE AND RECOVERY	2020	PROJECT SPONSOR(S): AUSTIN	Yes	90,000 AFY	TBD		Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No		Notes: (1) Sponsor is in consultant procurement process (2) Project is anticipated to be online by 2040, with further expansions planned in the future; (2) project is anticipated to continue expanding up to 2115 as needed.
K	CITY OF AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	No	3,000 AFY		2040	Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Notes: (1) Per Austin's Water Forward Plan, this strategy is targeted to be online by 2040
K	CITY OF AUSTIN - DIRECT REUSE	2020	PROJECT SPONSOR(S): AUSTIN	Yes	54,600 AFY	$422M through 2115		Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Notes: (1) Direct Reuse refers to centralized direct non-potable reuse, or purple pipe systems; (2) this strategy is currently operating, but will continue to expand; (3) the planned maximum capacity is through the year 2115; future plans will continue to update planning horizon.
K	CITY OF AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	2020	PROJECT SPONSOR(S): AUSTIN	No	20,000 AFY	$91M	2040	Other	TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Note: (1) Project is planned to be online by 2040; (2) project would only be used in drought conditions when combined storage in the Highland Lakes falls below 400,000 AF.
K	CITY OF AUSTIN - LAKE AUSTIN OPERATIONS	2020	WMS SUPPLY RECIPIENT: AUSTIN	No	2,500 AFY	No capital costs; O&M costs only		Other	Cash - revenues	Yes	No	No	Note: (1) Project would come online as necessary to respond to drought conditions; (2) project would be used during non-peak months (Oct.-May) and after combined storage in the Highland Lakes is below 600,000 AF.
K	CITY OF AUSTIN - LAKE LONG ENHANCED STORAGE	2020	PROJECT SPONSOR(S): AUSTIN							No			
K	CITY OF AUSTIN - LONGHORN DAM OPERATIONS IMPROVEMENTS	2020	PROJECT SPONSOR(S): AUSTIN	Yes	3,000 AFY	Pending earlier phases		Other	Bonds	Yes	No	No	
K	CITY OF AUSTIN - OTHER REUSE	2020	PROJECT SPONSOR(S): AUSTIN	Yes	64,350 AFY in 2115	This strategy was broken into several individual strategies for the 2021 planning cycle; costs are being developed for these strategies		Other	Developers/Program Participants; TWDB - SWIFT; TWDB - SRF; Cash; Bonds; etc.	Yes	No	No	Note: (1) Project implementation is ongoing; (2) Water Forward plans for implementation to continue through 2115, with corresponding capacity increases.
K	CITY OF AUSTIN - RAINWATER HARVESTING	2020	PROJECT SPONSOR(S): AUSTIN	Yes	9,250 ac-ft/yr	TBD; generally to be borne by development with pot		Other	TBD; generally funded by development with potential for cost offsets through utility incentives	Yes	No	No	Notes: (1) This strategy has been re-evaluated as part of the 2018 Water Forward Plan; (2) this strategy is currently operating, but will continue to expand; (3) the planned maximum capacity is through the year 2115; future plans will continue to update planning horizon.
K	CITY OF AUSTIN CONSERVATION	2020	PROJECT SPONSOR(S): AUSTIN	Yes	37,000 AFY	$41M		Other	Combination of funding including TWDB SWIFT and Utility O&M and CIP	Yes	No	No	conservation program since the 1980s and continues to advance the program, (2) Austin's Water Forward Plan includes implementation of conservation strategies through the full planning horizon to 2115
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: AUSTIN						n/a	Yes	No	No	Notes: Austin and LCRA have a pending joint water right permit application at TCEQ for bed and banks reuse of Austin's return flows. As part of the regional planning process, prior to the issuance of the permit and development of a project, Austin's projected return flows are a water management strategy for downstream uses.
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: IRRIGATION, MATAGORDA										

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: IRRIGATION, WHARTON										
K	CITY OF AUSTIN RETURN FLOWS	2020	WMS SUPPLY RECIPIENT: STEAM ELECTRIC POWER, MATAGORDA										
K	DEVELOPMENT OF NEW CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP	2020	PROJECT SPONSOR(S): BASTROP										
K	DEVELOPMENT OF NEW HICKORY AQUIFER SUPPLIES - LLANO	2020	PROJECT SPONSOR(S): LLANO										
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - BASTROP COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (BASTROP)										
K	DIRECT REUSE - BUDA	2020	PROJECT SPONSOR(S): BUDA	Yes	1680 AFY		2050			Yes	No		Effluent forcemain to Sunfield MUD, complete by 2022. Sunfield can take up to 1120ac-ft/yr for use in the MUD. Feasibility study underway to maximize current system use and potentially add additional storage capacity.
K	DIRECT REUSE - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA										
K	DIRECT REUSE - HORSESHOE BAY	2020	WMS SUPPLY RECIPIENT: HORSESHOE BAY	Yes	1,344	$1,070,000	2050	Market	Private funds from golf course	Yes	No	No	
K	DIRECT REUSE - LLANO	2020	PROJECT SPONSOR(S): LLANO	No						Yes			
K	DIRECT REUSE - MARBLE FALLS	2020	WMS SUPPLY RECIPIENT: MARBLE FALLS										
K	DIRECT REUSE - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE	Yes	n/a	n/a	2030		n/a	No	No	No	Water reuse for irrigation already in effect for a nearby county park, with a tentative plan to distribute reused water to all city parks within the next 10 years. Any project costs or funds expended to date are currently not available for input.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AQUA WSC								No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: AUSTIN	No				Other	Revenues from customers		No	No	Project is currently online and anticipated to remain online throught the planning horizon.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BARTON CREEK WEST WSC										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BASTROP										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BASTROP COUNTY WCID #2										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BAY CITY	No				Other	Bay City - Utility Enterprise Fund	Yes	No	No	DCP was reviewed/updated & adopted by City Council on 11/5/2019. Since plan inception in 1999 the City of Bay City has not faced drought conditions or a water demand that require implementation of drought trigger responses.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BEE CAVE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BERTRAM	No			2040	TWDB - Other	DWSRF	Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BLANCO										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BRIARCLIFF										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BUDA							Yes	No		
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: BURNET										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COLUMBUS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COTTONWOOD SHORES										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BASTROP										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BLANCO										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, BURNET										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, COLORADO										

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K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, FAYETTE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, GILLESPIE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, HAYS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, LLANO										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, MATAGORDA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, MILLS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, SAN SABA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: COUNTY-OTHER, WHARTON										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: CREEDMOOR-MAHA WSC	No			2025	TWDB - Other		Yes	No	No	Drought contingency plan has been adopted by the WSC; steps will be implemented once triggers are reached. While plan will not create new water, it will postpone need to find new sources/supply.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: DRIPPING SPRINGS WSC										The DSWSC Drought Contingency Plan is currently being revised with help from the LCRA. DSWSC staff will be presenting a draft copy to the Board of Directors for their review and approval.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: EAGLE LAKE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: EAST BERNARD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: ELGIN										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FAYETTE WSC	No			2025	Commercial/Bank loan		Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FLATONIA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: FREDERICKSBURG										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: GOLDTHWAITE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: GRANITE SHOALS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: HORSESHOE BAY					Other		Yes	No	No	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, COLORADO										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, MATAGORDA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, MILLS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: IRRIGATION, WHARTON										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: JOHNSON CITY										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: JONESTOWN										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: KINGSLAND WSC										

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Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LA GRANGE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LAGO VISTA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LAKEWAY										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LLANO	No						Yes			
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LOOP 360 WSC										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: LOST CREEK MUD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANOR										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MANVILLE WSC										During the most recent drought of record in 2011, Manville implemented stage II, twice a week outside watering water restrictions on July 1, 2011.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MARBLE FALLS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: MEADOWLAKES										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: NORTH AUSTIN MUD #1										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: NORTHTOWN MUD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PALACIOS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: PFLUGERVILLE	Yes	n/a	n/a	2070		n/a	Yes	No	No	"Year Project is online" is actually 2006 but year not available in drop-down option, used earliest provided. Any project costs or funds expended to date are currently not available for input.
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: POINT VENTURE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: ROLLINGWOOD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SAN SABA										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SCHULENBURG										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SHADY HOLLOW MUD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SMITHVILLE	No			2070	Other	Utility Fund	Yes	No	Potentially, but no technical flood analysis performed	
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SUNRISE BEACH VILLAGE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: SUNSET VALLEY										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: THE HILLS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY MUD #4										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #10										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #17										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #18										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #19										

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K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: TRAVIS COUNTY WCID #20										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: VOLENTE										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEIMAR										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WELLS BRANCH MUD										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEST LAKE HILLS										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY										
K	DROUGHT MANAGEMENT	2020	WUG REDUCING DEMAND: WHARTON										
K	DROUGHT MANAGEMENT - MOUNTAIN CITY	2020	WUG REDUCING DEMAND: MOUNTAIN CITY										
K	EAST LAKE BUCHANAN REGIONAL PROJECT	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BURNET)										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC							Yes			Added 1200 gpm Behrend Well to McDade Well Field
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (BASTROP)										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BASTROP)										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - ELGIN	2020	PROJECT SPONSOR(S): ELGIN										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - LCRA	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	25,000 AFY	$46,629,000		Other	Any combination of funding sources listed.	Yes	No	No	Year project reaches maximum capacity will depend on demand
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	Yes	2,000 AFY	$16,345,000		TWDB - Other	DWSRF	Yes	No	No	
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BURNET COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (BURNET)										
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - GILLESPIE COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (GILLESPIE)										
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - JOHNSON CITY	2020	PROJECT SPONSOR(S): JOHNSON CITY										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - COLORADO COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (COLORADO)										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY MANUFACTURING	2020	PROJECT SPONSOR(S): MANUFACTURING (FAYETTE)										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (FAYETTE)										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FAYETTE COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (FAYETTE)										
K	EXPANSION OF GULF COAST AQUIFER SUPPLIES - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA										
K	EXPANSION OF SPARTA AQUIFER SUPPLIES - FAYETTE COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (FAYETTE)										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - HAYS COUNTY MINING	2020	PROJECT SPONSOR(S): MINING (HAYS)										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - LAKEWAY	2020	PROJECT SPONSOR(S): LAKEWAY										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MILLS COUNTY IRRIGATION	2020	PROJECT SPONSOR(S): IRRIGATION (MILLS)										
K	IRRIGATION CONSERVATION - ON FARM	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)										
K	IRRIGATION CONSERVATION - SPRINKLER	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)										
K	IRRIGATION OPERATIONS CONVEYANCE IMPROVEMENTS	2020	PROJECT SPONSOR(S): IRRIGATION (COLORADO); IRRIGATION (MATAGORDA); IRRIGATION (WHARTON)										
K	LCRA - ACQUIRE ADDITIONAL WATER RIGHTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	25,000	$125,000		Other	Any combination of funding sources listed.	Yes	No	No	Water rights will be acquired as they become available at a suitable cost.
K	LCRA - CONTRACT AMENDMENTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	Yes	39,466	$151/AF		Other	Customer project revenue	Yes	No	No	Project will come online as needed by customers
K	LCRA - ENHANCED MUNICIPAL AND INDUSTRIAL CONSERVATION	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY		20,000		2050	Other	General revenue from water rates	Yes	No	No	This references the 2019 LCRA WCP, which is updated every five years.
K	LCRA - EXCESS FLOWS PERMIT OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No				Other	Any combination of funding sources listed.	Yes	No	Potentially, but no technical flood analysis performed	If an existing OCR site is chosen, and permitting is successful, then project could be online before 2030.

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	LCRA - GROUNDWATER SUPPLY FOR FPP (OFF-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY							No			LCRA is no longer recommending this alternative
K	LCRA - GROUNDWATER SUPPLY FOR FPP (ON-SITE)	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY							No			LCRA is no longer recommending this alternative
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, COLORADO										
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, MATAGORDA										
K	LCRA - INTERRUPTIBLE WATER FOR AGRICULTURE (LCRA WMP AMENDMENTS)	2020	WMS SELLER: LOWER COLORADO RIVER AUTHORITY; WMS SUPPLY RECIPIENT: IRRIGATION, WHARTON										
K	LCRA - LANE CITY OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY										
K	LCRA - MID-BASIN OFF-CHANNEL RESERVOIR	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No			2030	Other	Any combination of funding sources listed.	Yes			
K	LCRA - NEW LCRA CONTRACTS	2020	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY	No						Yes	No	No	New contracts will be entered as needed.
K	MARBLE FALLS REGIONAL PROJECT	2020	PROJECT SPONSOR(S): COTTONWOOD SHORES; COUNTY-OTHER (BURNET); MARBLE FALLS										
K	MUNICIPAL CONSERVATION - AQUA WSC	2020	PROJECT SPONSOR(S): AQUA WSC									No	
K	MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	2020	PROJECT SPONSOR(S): BARTON CREEK WEST WSC										
K	MUNICIPAL CONSERVATION - BASTROP	2020	PROJECT SPONSOR(S): BASTROP										
K	MUNICIPAL CONSERVATION - BASTROP COUNTY OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BASTROP)										
K	MUNICIPAL CONSERVATION - BAY CITY	2020	PROJECT SPONSOR(S): BAY CITY	No				Other	Bay City - Utility Enterprise Fund	No	No	No	Council on 11/5/2019. Water saving target achieved in 2019 for the residential class via capital measures (replace aging waterlines & install AMI) & outreach/education. Future efforts will target commercial & institutional classes.
K	MUNICIPAL CONSERVATION - BEE CAVE VILLAGE	2020	PROJECT SPONSOR(S): BEE CAVE										
K	MUNICIPAL CONSERVATION - BERTRAM	2020	PROJECT SPONSOR(S): BERTRAM	Yes	80 AFY	$130,000	2060	Other	Rates and Fees	Yes	No	No	
K	MUNICIPAL CONSERVATION - BLANCO	2020	PROJECT SPONSOR(S): BLANCO										
K	MUNICIPAL CONSERVATION - BUDA	2020	PROJECT SPONSOR(S): BUDA				2020	Commercial/Bank loan		Yes	No		also had a leak detection survey performed on part of the system, and will continue with more sections in the future along with other programs outlined in the WCP updated in 2019.
K	MUNICIPAL CONSERVATION - BURNET	2020	PROJECT SPONSOR(S): BURNET										
K	MUNICIPAL CONSERVATION - BURNET COUNTY-OTHER	2020	PROJECT SPONSOR(S): COUNTY-OTHER (BURNET)										
K	MUNICIPAL CONSERVATION - CEDAR PARK	2020	PROJECT SPONSOR(S): CEDAR PARK	No			2040	Other	Self pay and Bonds	Yes	No	No	
K	MUNICIPAL CONSERVATION - COLUMBUS	2020	PROJECT SPONSOR(S): COLUMBUS										
K	MUNICIPAL CONSERVATION - COTTONWOOD SHORES	2020	PROJECT SPONSOR(S): COTTONWOOD SHORES										
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS										
K	MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	2020	PROJECT SPONSOR(S): DRIPPING SPRINGS WSC										DSWSC staff is currently revising and updating the WCP with help from the LCRA. A draft copy is planned to be reviewed and approved by the DSWSC Board of Directors.
K	MUNICIPAL CONSERVATION - EAST BERNARD	2020	PROJECT SPONSOR(S): EAST BERNARD										
K	MUNICIPAL CONSERVATION - FLATONIA	2020	PROJECT SPONSOR(S): FLATONIA										
K	MUNICIPAL CONSERVATION - FREDERICKSBURG	2020	PROJECT SPONSOR(S): FREDERICKSBURG										
K	MUNICIPAL CONSERVATION - GOLDTHWAITE	2020	PROJECT SPONSOR(S): GOLDTHWAITE										
K	MUNICIPAL CONSERVATION - HORSESHOE BAY	2020	PROJECT SPONSOR(S): HORSESHOE BAY	No			2040	Other	Utility rates of customers	Yes	No	No	
K	MUNICIPAL CONSERVATION - JOHNSON CITY	2020	PROJECT SPONSOR(S): JOHNSON CITY										
K	MUNICIPAL CONSERVATION - JONESTOWN	2020	PROJECT SPONSOR(S): JONESTOWN										
K	MUNICIPAL CONSERVATION - LA GRANGE	2020	PROJECT SPONSOR(S): LA GRANGE										
K	MUNICIPAL CONSERVATION - LAGO VISTA	2020	PROJECT SPONSOR(S): LAGO VISTA										
K	MUNICIPAL CONSERVATION - LAKEWAY	2020	PROJECT SPONSOR(S): LAKEWAY										
K	MUNICIPAL CONSERVATION - LLANO	2020	PROJECT SPONSOR(S): LLANO							Yes			
K	MUNICIPAL CONSERVATION - LOOP 360	2020	PROJECT SPONSOR(S): LOOP 360 WSC										
K	MUNICIPAL CONSERVATION - LOST CREEK MUD	2020	PROJECT SPONSOR(S): LOST CREEK MUD										
K	MUNICIPAL CONSERVATION - MARBLE FALLS	2020	PROJECT SPONSOR(S): MARBLE FALLS										
K	MUNICIPAL CONSERVATION - MEADOWLAKES	2020	PROJECT SPONSOR(S): MEADOWLAKES										
K	MUNICIPAL CONSERVATION - PFLUGERVILLE	2020	PROJECT SPONSOR(S): PFLUGERVILLE		n/a	n/a	2025		n/a	Yes	No	No	Advanced Metering Infrastructure - not yet implemented. Any project costs or funds expended to date are currently not available for input.
K	MUNICIPAL CONSERVATION - POINT VENTURE	2020	PROJECT SPONSOR(S): POINT VENTURE										
K	MUNICIPAL CONSERVATION - ROLLINGWOOD	2020	PROJECT SPONSOR(S): ROLLINGWOOD										
K	MUNICIPAL CONSERVATION - ROUND ROCK	2020	PROJECT SPONSOR(S): ROUND ROCK										
K	MUNICIPAL CONSERVATION - SAN SABA	2020	PROJECT SPONSOR(S): SAN SABA										
K	MUNICIPAL CONSERVATION - SCHULENBURG	2020	PROJECT SPONSOR(S): SCHULENBURG										

Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	2020	PROJECT SPONSOR(S): SHADY HOLLOW MUD										
K	MUNICIPAL CONSERVATION - SMITHVILLE	2020	PROJECT SPONSOR(S): SMITHVILLE	No			2070	Other	Qualified Energy Conservation Bonds	Yes	No	Yes, flood risk study confirmed benefits	
K	MUNICIPAL CONSERVATION - SUNSET VALLEY	2020	PROJECT SPONSOR(S): SUNSET VALLEY										
K	MUNICIPAL CONSERVATION - THE HILLS	2020	PROJECT SPONSOR(S): THE HILLS										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD #4	2020	PROJECT SPONSOR(S): TRAVIS COUNTY MUD #4										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #10	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #10										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #17	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #17										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #18	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #18										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #19	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #19										
K	MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID #20	2020	PROJECT SPONSOR(S): TRAVIS COUNTY WCID #20										
K	MUNICIPAL CONSERVATION - WEIMAR	2020	PROJECT SPONSOR(S): WEIMAR										
K	MUNICIPAL CONSERVATION - WEST LAKE HILLS	2020	PROJECT SPONSOR(S): WEST LAKE HILLS										
K	MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	2020	PROJECT SPONSOR(S): WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY										
K	MUNICIPAL CONSERVATION - WHARTON	2020	PROJECT SPONSOR(S): WHARTON										
K	NEW SURFACE WATER INFRASTRUCTURE - VOLENTE	2020	PROJECT SPONSOR(S): VOLENTE										
K	URGENT WATER LOSS REDUCTION PROJECT - CMWSC	2020	PROJECT SPONSOR(S): CREEDMOOR-MAHA WSC	No			2025	TWDB - Other			No	No	
K	BS/EACD EDWARDS / MIDDLE TRINITY ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); MINING (HAYS); MOUNTAIN CITY; SUNSET VALLEY	Yes	~600 AFY	$7,750,000	2030	Other	Current project is funded from Certificate of Obligation Utility Bond, options being explored for future phases	Yes	No	No	
K	BS/EACD SALINE EDWARDS ASR	2030	PROJECT SPONSOR(S): BUDA; COUNTY-OTHER (HAYS); CREEDMOOR-MAHA WSC							Yes	No	No	[illegible] not an option Buda will pursue since we can store in the Trinity Aquifer. A feasibility study desalinating Saline Edwards and having an ASR component to keep plant size efficient is a possible option for Buda, and I think the original intent of this WMS.
K	EXPANSION OF HICKORY AQUIFER SUPPLIES - BURNET COUNTY MINING	2030	PROJECT SPONSOR(S): MINING (BURNET)										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANOR	2030	PROJECT SPONSOR(S): MANOR										
K	HAYS COUNTY PIPELINE - REGION K PORTION	2030	PROJECT SPONSOR(S): WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY; COUNTY-OTHER (HAYS); DRIPPING SPRINGS WSC										[illegible] conversation with the DSWSC Board of Directors as well as with DSWSC staff members. At this time, no action has been taken.
K	LCRA - PRAIRIE SITE OFF-CHANNEL RESERVOIR	2030	PROJECT SPONSOR(S): LOWER COLORADO RIVER AUTHORITY										
K	NEW SURFACE WATER INFRASTRUCTURE - ELGIN	2030	PROJECT SPONSOR(S): ELGIN										
K	WATER PURCHASE	2030	WMS SELLER: DRIPPING SPRINGS WSC; WMS SUPPLY RECIPIENT: DRIPPING SPRINGS										Currently there is no purchase contract with the City of Dripping Springs and DSWSC.
K	CITY OF AUSTIN RETURN FLOWS	2040	WMS SUPPLY RECIPIENT: IRRIGATION, COLORADO										
K	DEVELOPMENT OF NEW CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY MINING	2040	PROJECT SPONSOR(S): MINING (BASTROP)										
K	DEVELOPMENT OF NEW TRINITY AQUIFER SUPPLIES - SUNSET VALLEY	2040	PROJECT SPONSOR(S): SUNSET VALLEY										
K	DIRECT REUSE - BASTROP	2040	PROJECT SPONSOR(S): BASTROP										
K	DIRECT REUSE - BUDA	2040	WMS SELLER: BUDA; WMS SUPPLY RECIPIENT: MINING, HAYS										
K	EXPANSION OF EDWARDS (BFZ) AQUIFER SUPPLIES - PFLUGERVILLE	2040	PROJECT SPONSOR(S): PFLUGERVILLE		n/a	n/a				Yes			There are currently no expansion plans for Groundwater supplies.
K	NEW SURFACE WATER INFRASTRUCTURE - AQUA WSC	2040	PROJECT SPONSOR(S): AQUA WSC										
K	EXPANSION OF ELLENBURGER-SAN SABA AQUIFER SUPPLIES - BLANCO COUNTY-OTHER	2050	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO)										
K	EXPANSION OF HICKORY AQUIFER SUPPLIES - BLANCO COUNTY-OTHER	2050	PROJECT SPONSOR(S): COUNTY-OTHER (BLANCO)										
K	EXPANSION OF TRINITY AQUIFER SUPPLIES - MANVILLE WSC	2050	PROJECT SPONSOR(S): MANVILLE WSC										Current not applicable as the MWSC plan is for water expansion in 2050.
K	NEW SURFACE WATER INFRASTRUCTURE - BASTROP	2050	PROJECT SPONSOR(S): BASTROP										
K	DEVELOPMENT OF NEW GULF COAST AQUIFER SUPPLIES - WHARTON COUNTY STEAM-ELECTRIC	2060	PROJECT SPONSOR(S): STEAM ELECTRIC POWER (WHARTON)										
K	EXPANSION OF CARRIZO-WILCOX AQUIFER SUPPLIES - BASTROP COUNTY WCID #2	2060	PROJECT SPONSOR(S): BASTROP COUNTY WCID #2										
K	EXPANSION OF MARBLE FALLS AQUIFER SUPPLIES - BURNET COUNTY MINING	2060	PROJECT SPONSOR(S): MINING (BURNET)										
K	DEVELOPMENT OF NEW QUEEN CITY AQUIFER SUPPLIES - SMITHVILLE	2070	PROJECT SPONSOR(S): SMITHVILLE										

Table 11A-2: Full TWDB Template Containing Survey Results of Implementation Status of Water Management Strategies from the 2016 Region K Water Plan

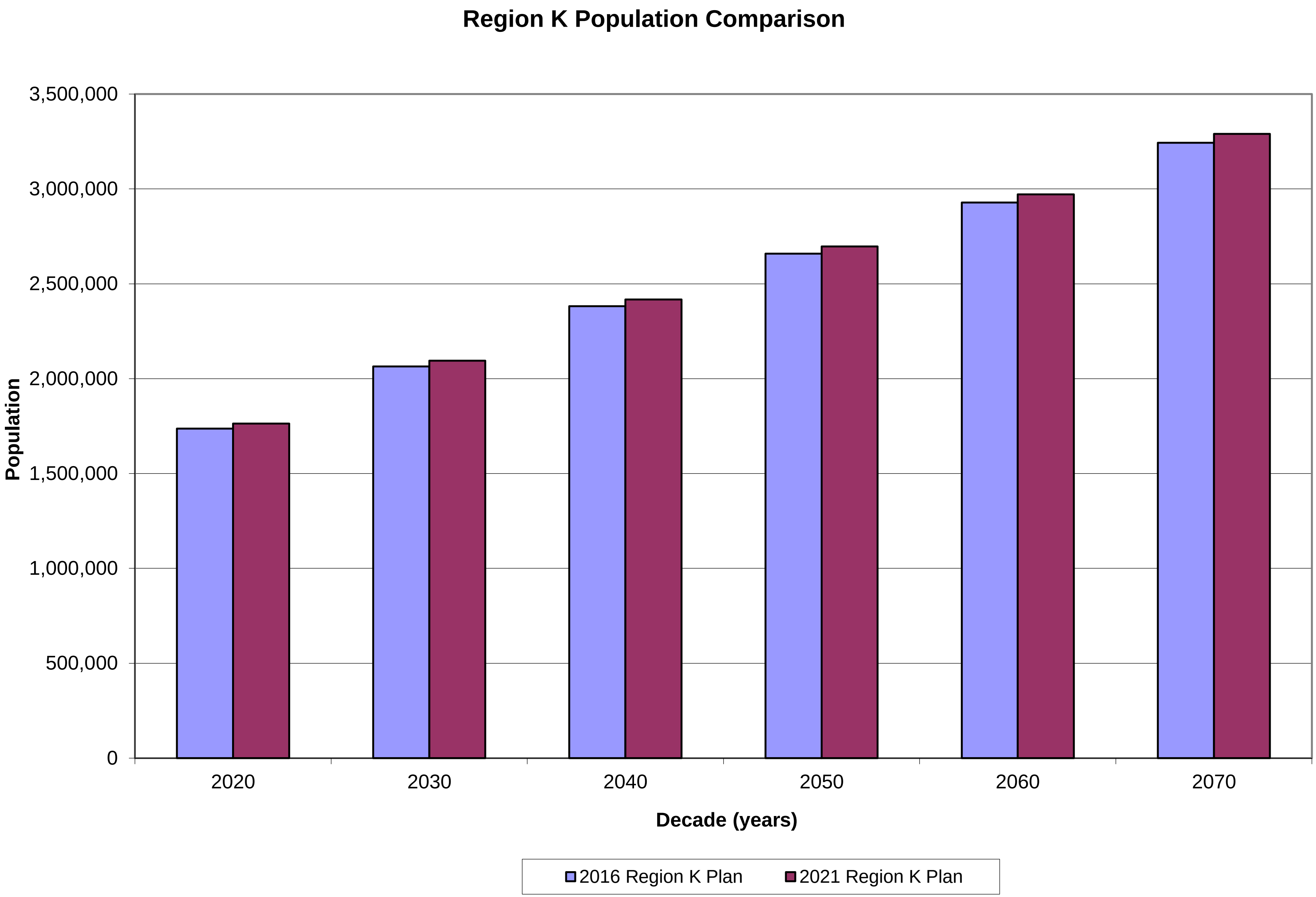
Planning Region	WMS or WMS Project Name	Database Online Decade	Related Sponsor Entity and/or Benefitting WUGs	Is this a phased project?*	(Phased) Ultimate volume (ac-ft/yr)	(Phased) Ultimate project cost ($)	Year project reaches maximum capacity?*	What is the project funding source(s)?*	Funding Mechanism if Other?	Included in 2021 plan?*	Does the project or WMS involve reallocation of flood control?*	Does the project or WMS provide any measurable flood risk reduction?*	Optional Comments
K	MUNICIPAL WATER CONSERVATION (RURAL)	2070	WUG REDUCING DEMAND: MOUNTAIN CITY										

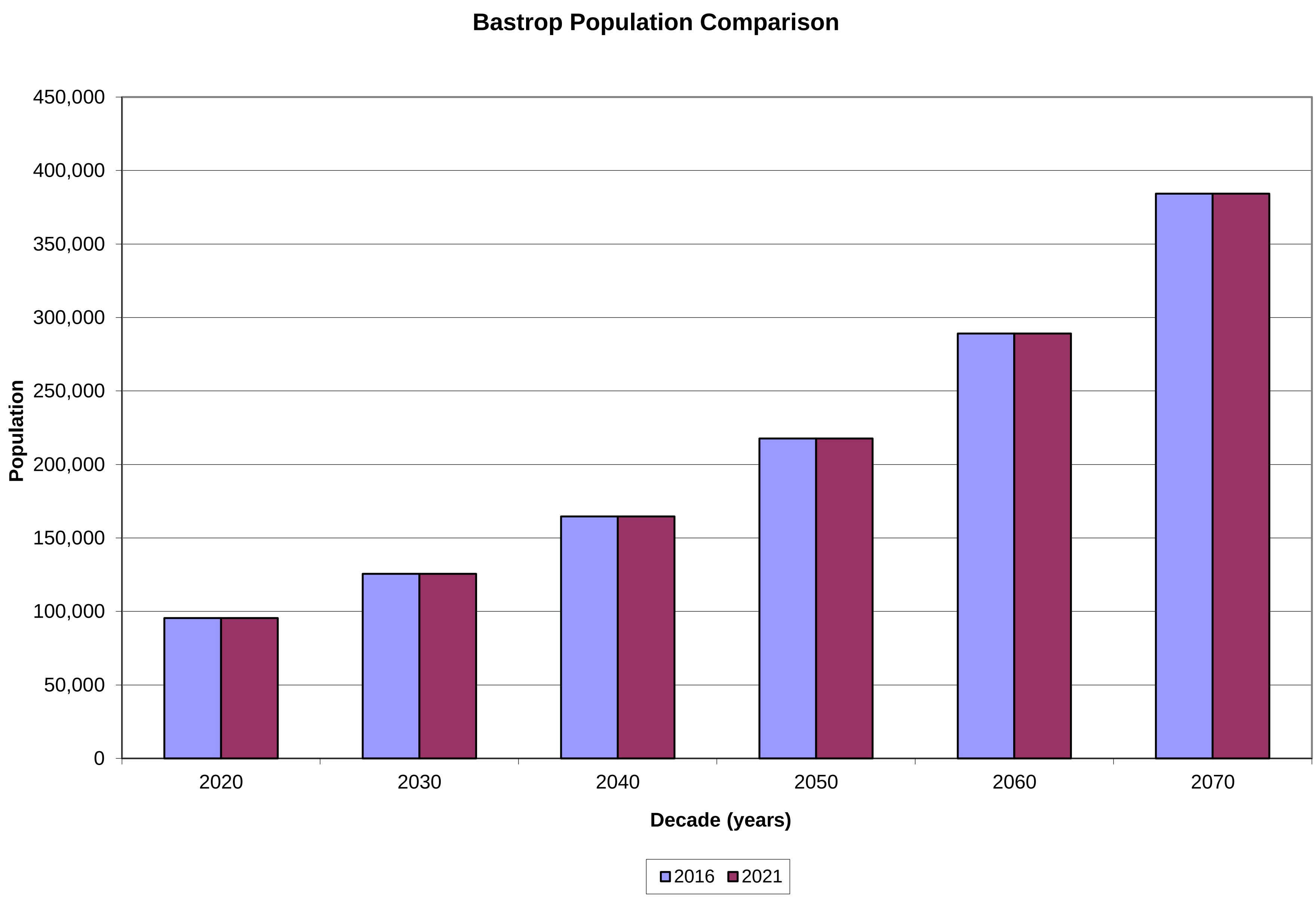
APPENDIX 11B

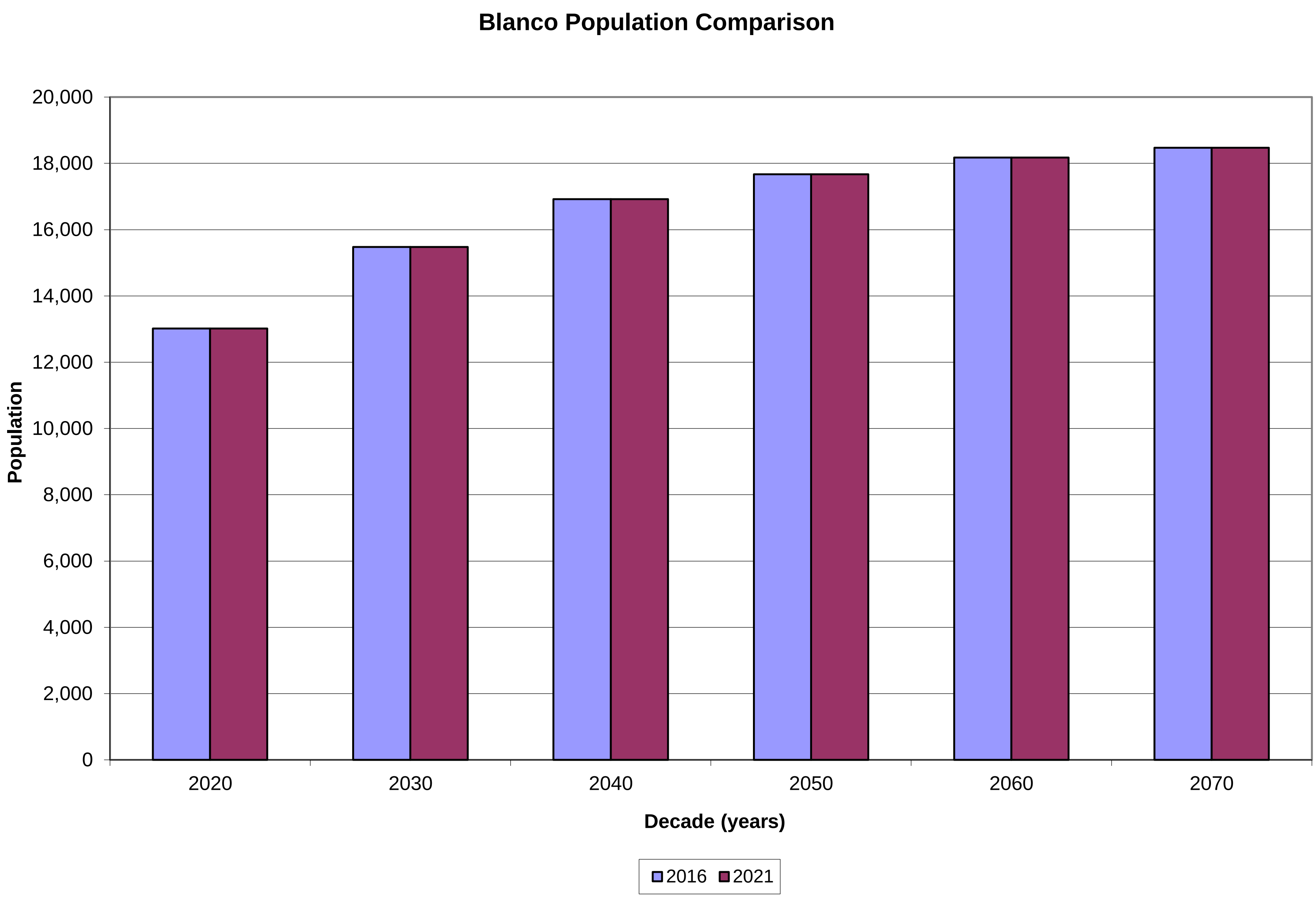
COMPARISON TABLES AND GRAPHS FOR POPULATION AND DEMAND PROJECTIONS

RWP	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Region K						
2021	1,762,591	2,094,664	2,416,725	2,697,306	2,971,155	3,290,477
2016	1,737,227	2,064,522	2,381,949	2,658,492	2,928,400	3,243,127
Difference	25,364	30,142	34,776	38,814	42,755	47,350
% Change	1.5	1.5	1.5	1.5	1.5	1.5
Bastrop						
2021	95,487	125,559	164,648	217,608	289,140	384,244
2016	95,487	125,559	164,648	217,608	289,140	384,244
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Blanco						
2021	13,015	15,475	16,917	17,672	18,175	18,472
2016	13,015	15,475	16,917	17,672	18,175	18,472
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Burnet						
2021	53,114	64,268	73,673	82,668	90,571	97,426
2016	53,114	64,268	73,673	82,668	90,571	97,426
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Colorado						
2021	21,884	22,836	23,544	24,582	25,449	26,293
2016	21,884	22,836	23,544	24,582	25,449	26,293
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Fayette						
2021	28,373	32,384	35,108	37,351	39,119	40,476
2016	28,373	32,384	35,108	37,351	39,119	40,476
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Gillespie						
2021	26,795	28,852	30,548	32,536	34,365	36,142
2016	26,795	28,852	30,548	32,536	34,365	36,142
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Hays						
2021	55,584	73,243	94,747	121,629	152,007	186,579
2016	55,584	73,243	94,747	121,629	152,007	186,579
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0

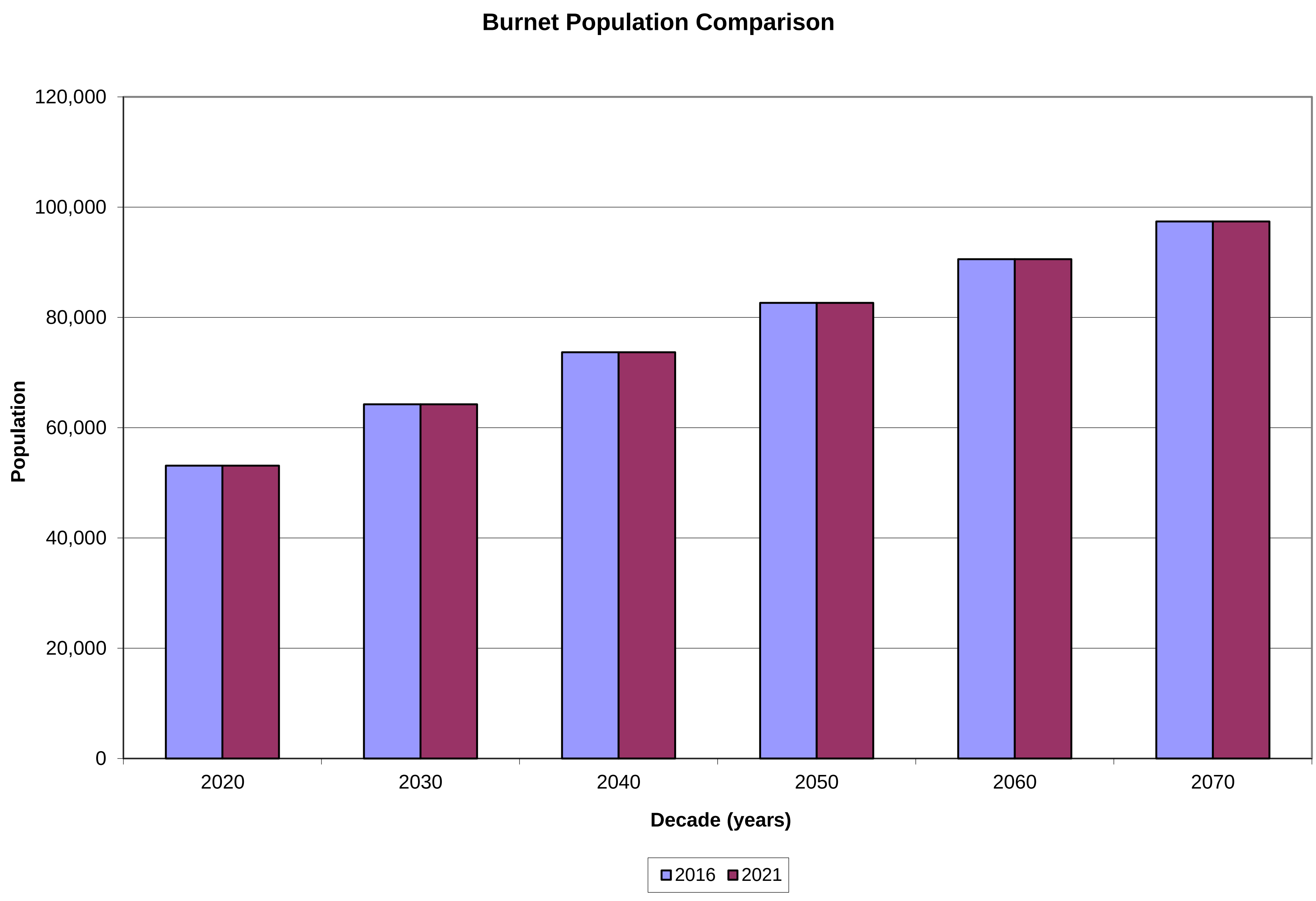
RWP	2020	2030	2040	2050	2060	2070
Llano						
2021	21,291	22,453	22,422	22,035	22,779	23,549
2016	21,291	22,453	22,422	22,035	22,779	23,549
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Matagorda						
2021	39,166	41,226	42,548	43,570	44,296	44,815
2016	39,166	41,226	42,548	43,570	44,296	44,815
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Mills						
2021	4,912	5,076	5,213	5,417	5,625	5,859
2016	4,912	5,076	5,213	5,417	5,625	5,859
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
San Saba						
2021	6,484	6,793	6,833	6,722	6,879	7,039
2016	6,484	6,793	6,833	6,722	6,879	7,039
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Travis						
2021	1,298,624	1,538,784	1,767,636	1,936,583	2,075,875	2,233,259
2016	1,273,260	1,508,642	1,732,860	1,897,769	2,033,120	2,185,909
Difference	25,364	30,142	34,776	38,814	42,755	47,350
% Change	2.0	2.0	2.0	2.0	2.1	2.2
Wharton						
2021	27,184	28,928	30,322	31,529	32,643	33,629
2016	27,184	28,928	30,322	31,529	32,643	33,629
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0
Williamson						
2021	70,678	88,787	102,566	117,404	134,232	152,695
2016	70,678	88,787	102,566	117,404	134,232	152,695
Difference	0	0	0	0	0	0
% Change	0.0	0.0	0.0	0.0	0.0	0.0

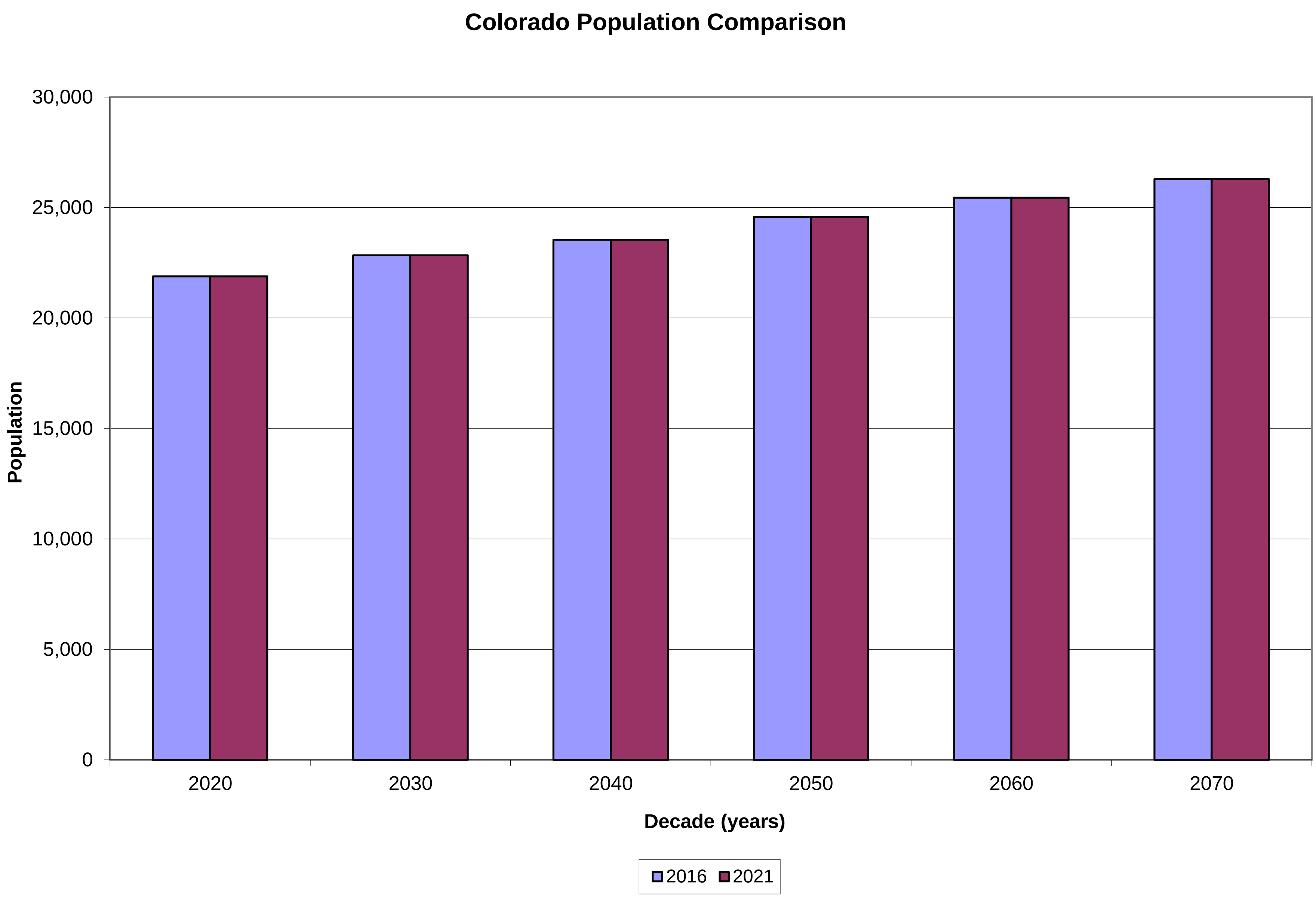

Region K Population Comparison
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016 Region K Plan
2021 Region K Plan


Bastrop Population Comparison
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

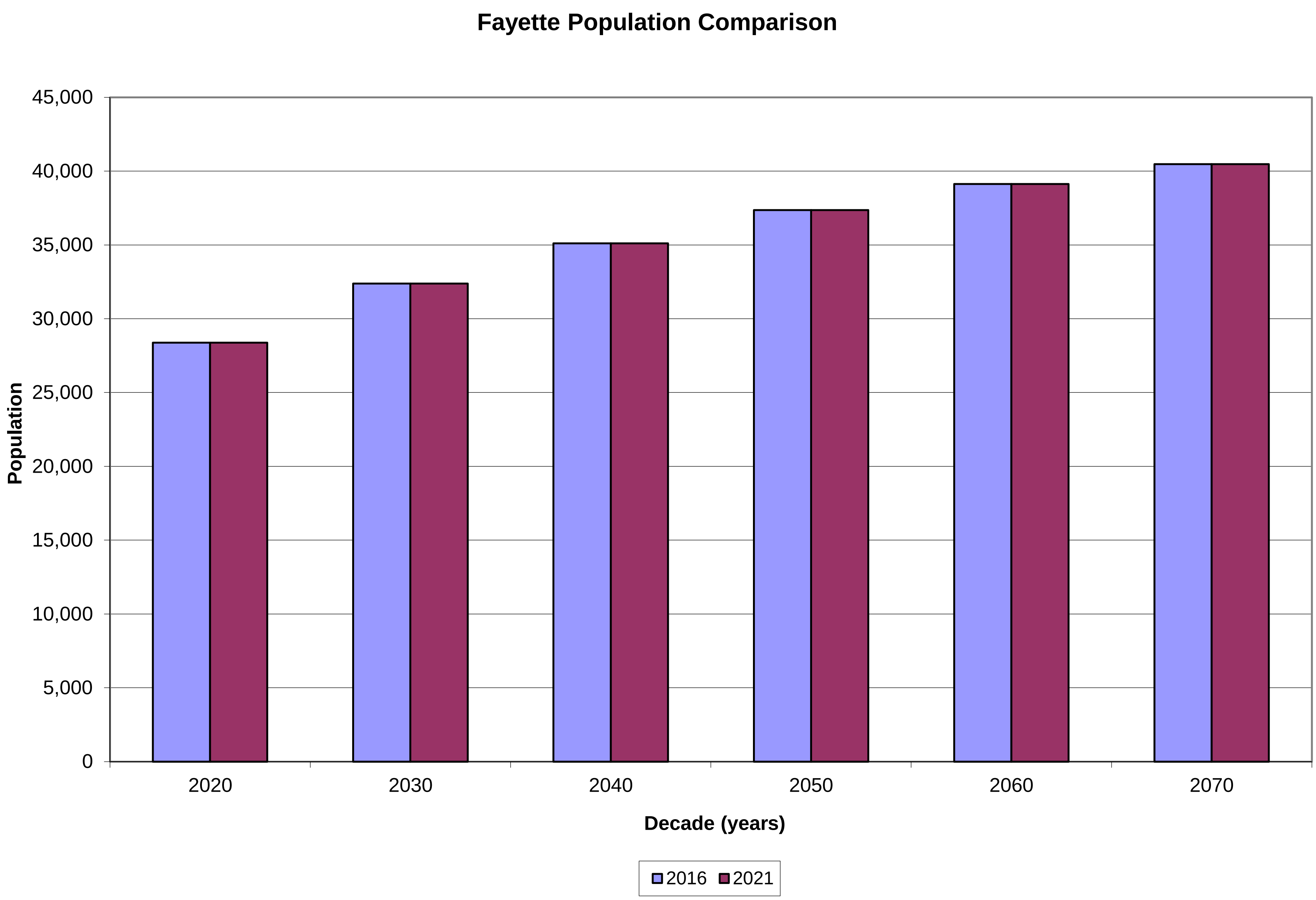


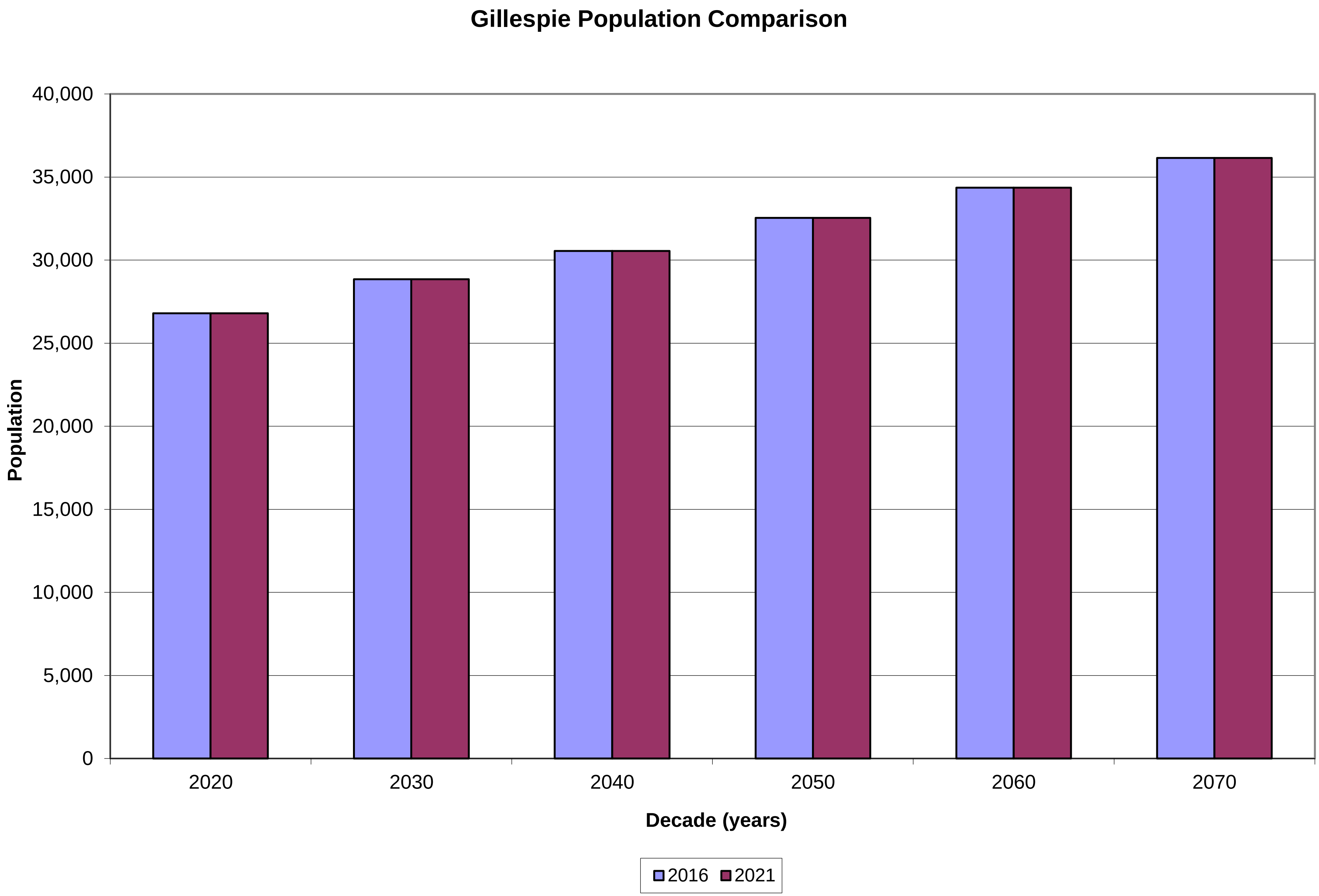
Blanco Population Comparison
Population
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

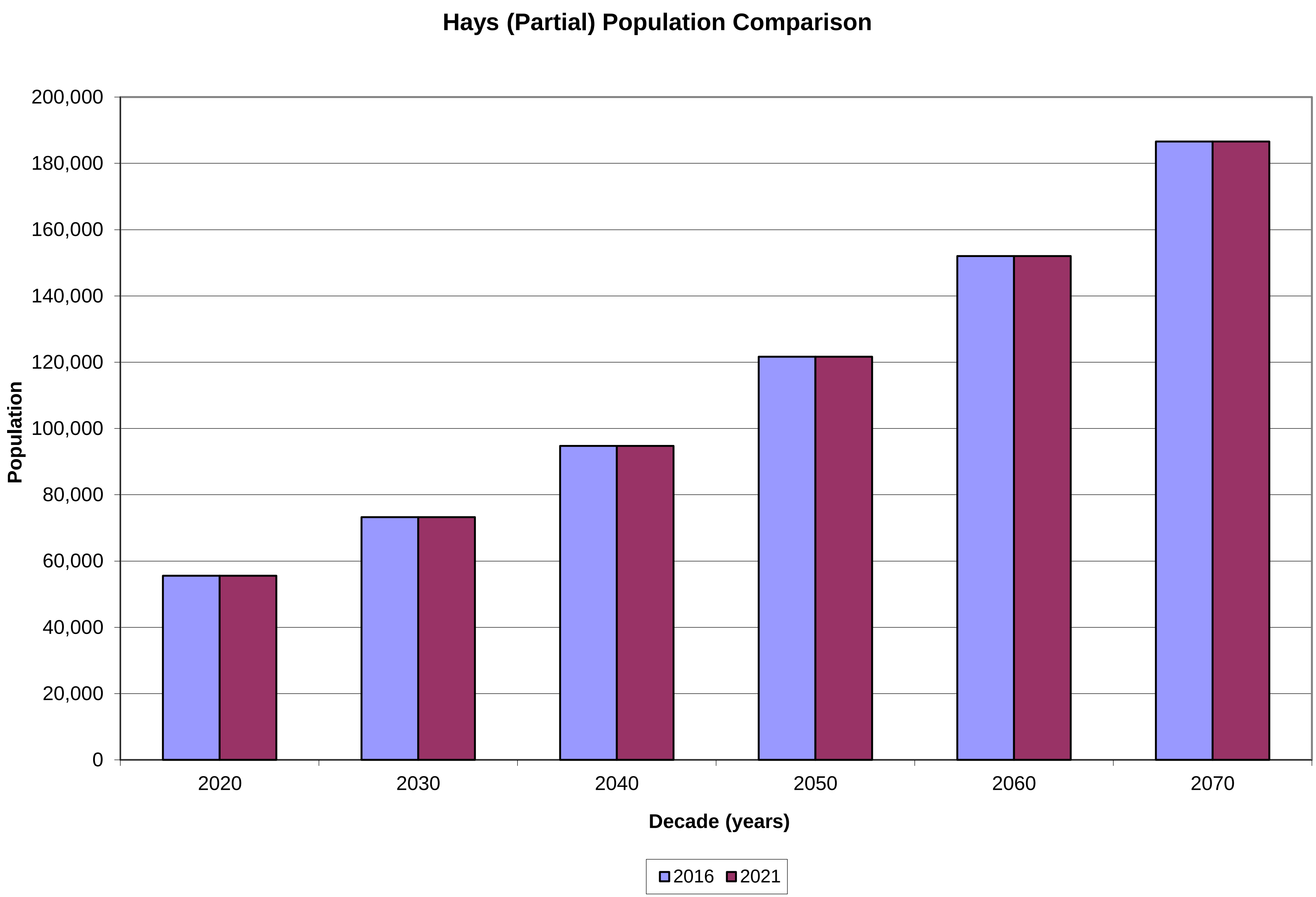

Burnet Population Comparison
120,000
100,000
80,000
60,000
40,000
20,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



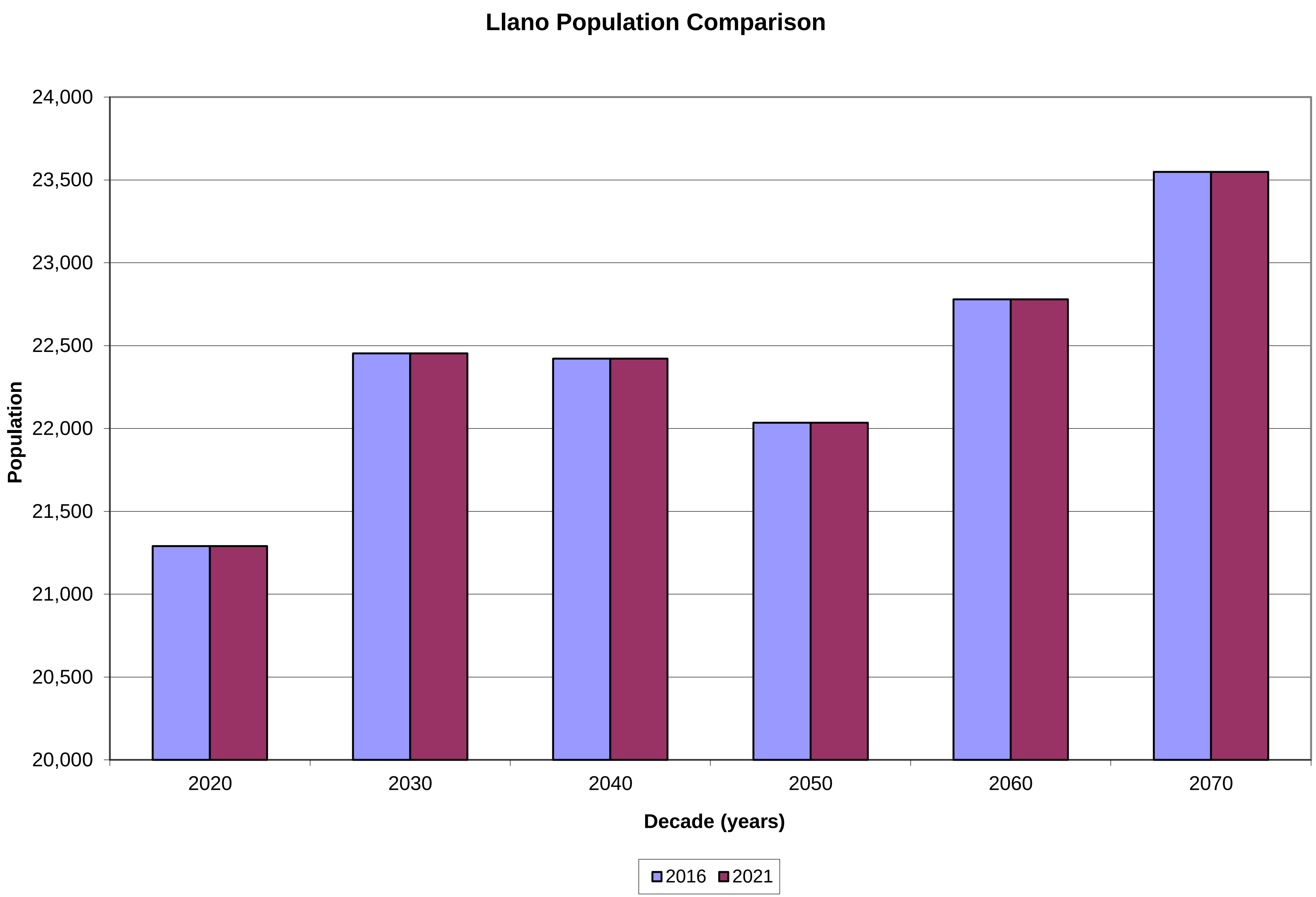
Colorado Population Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021


Fayette Population Comparison
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

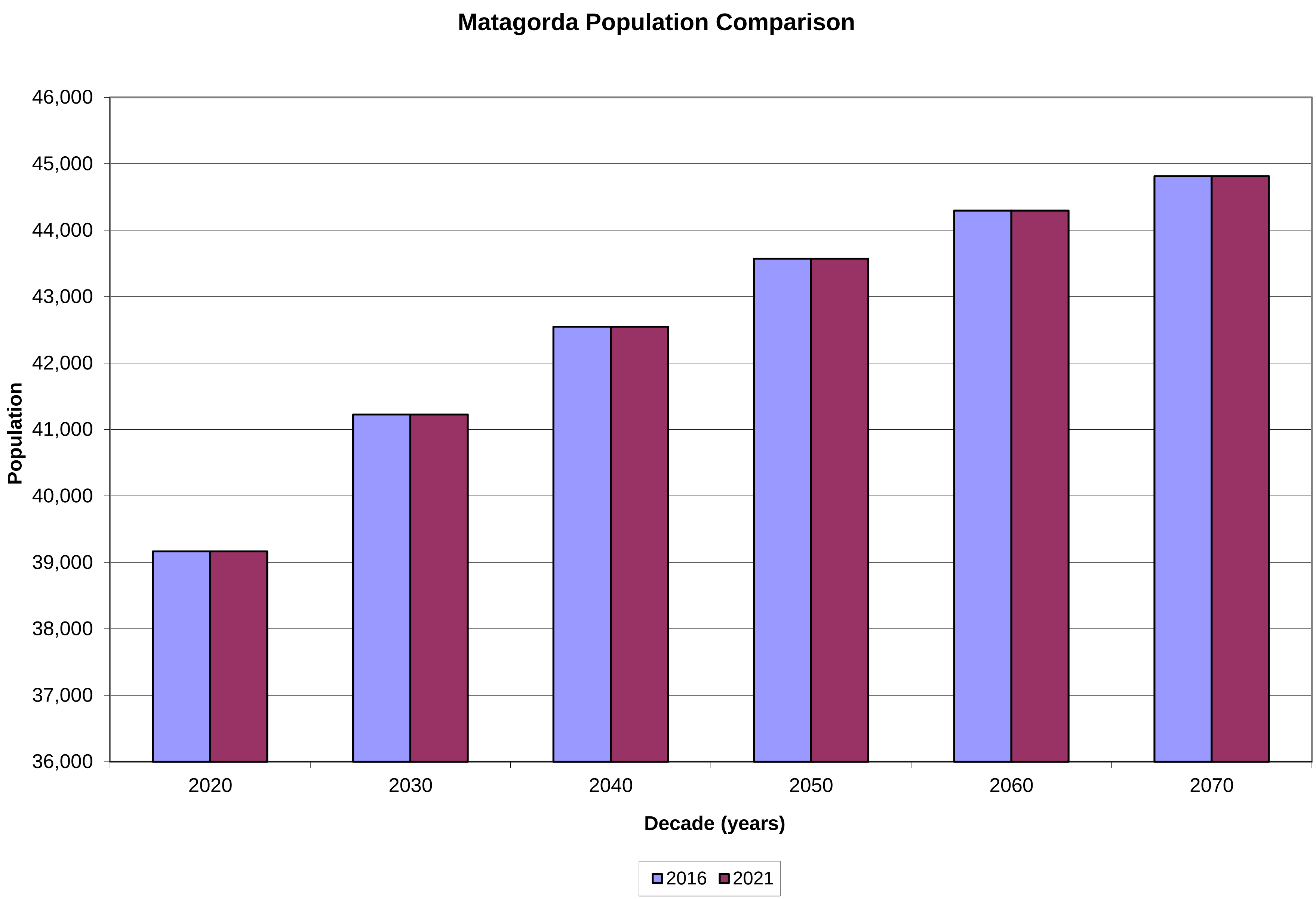

Gillespie Population Comparison
Population
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



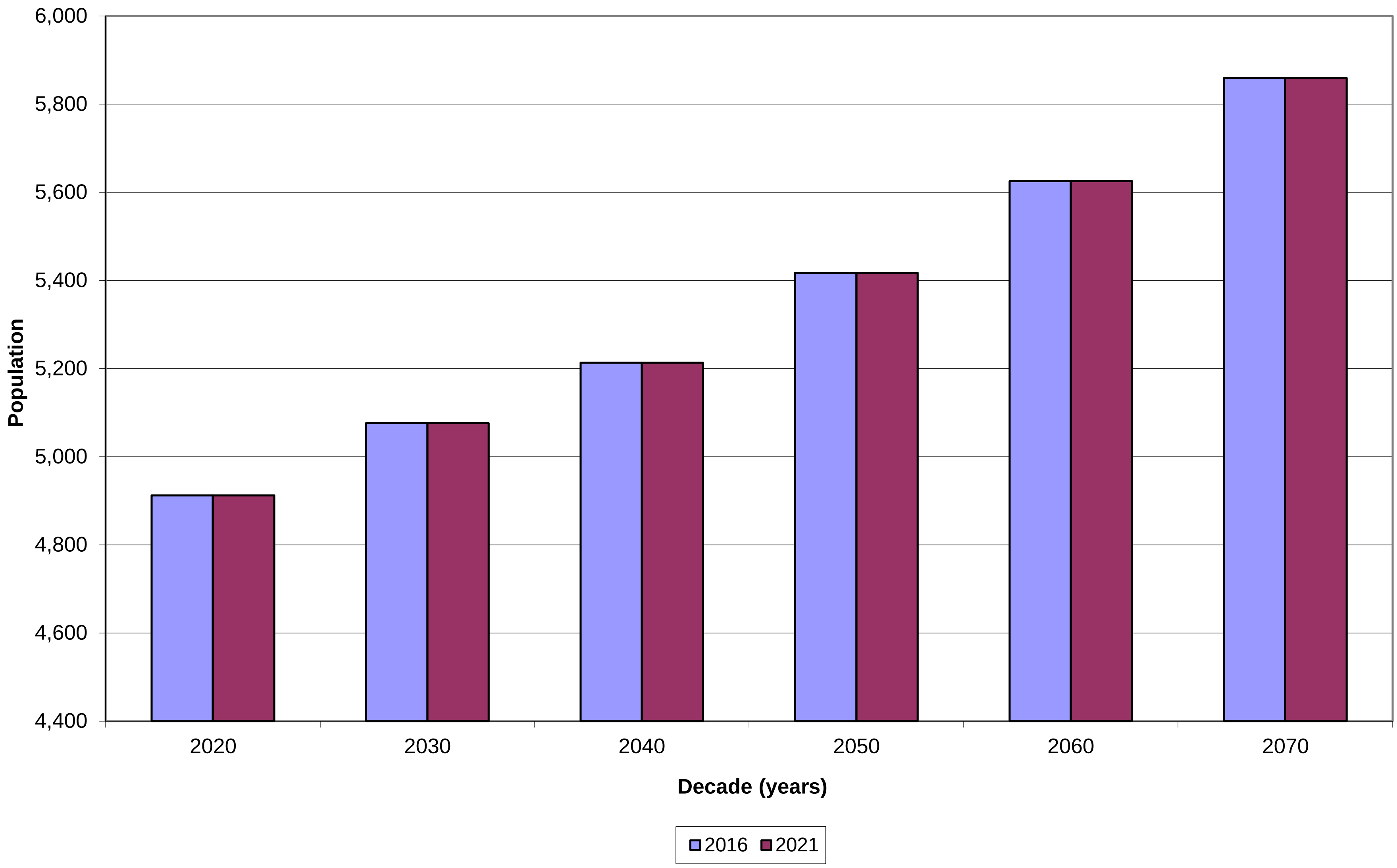
Hays (Partial) Population Comparison
Population
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

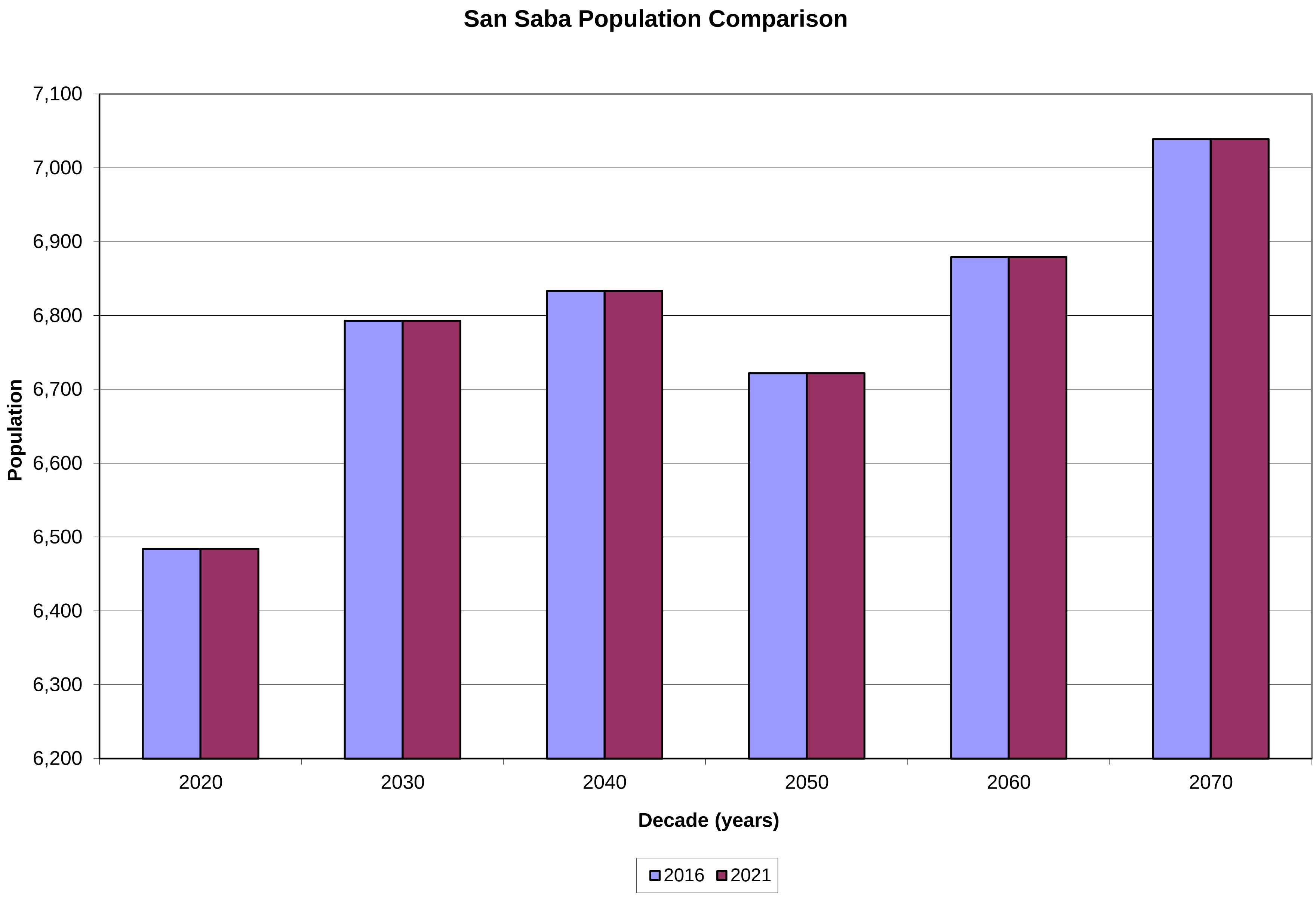


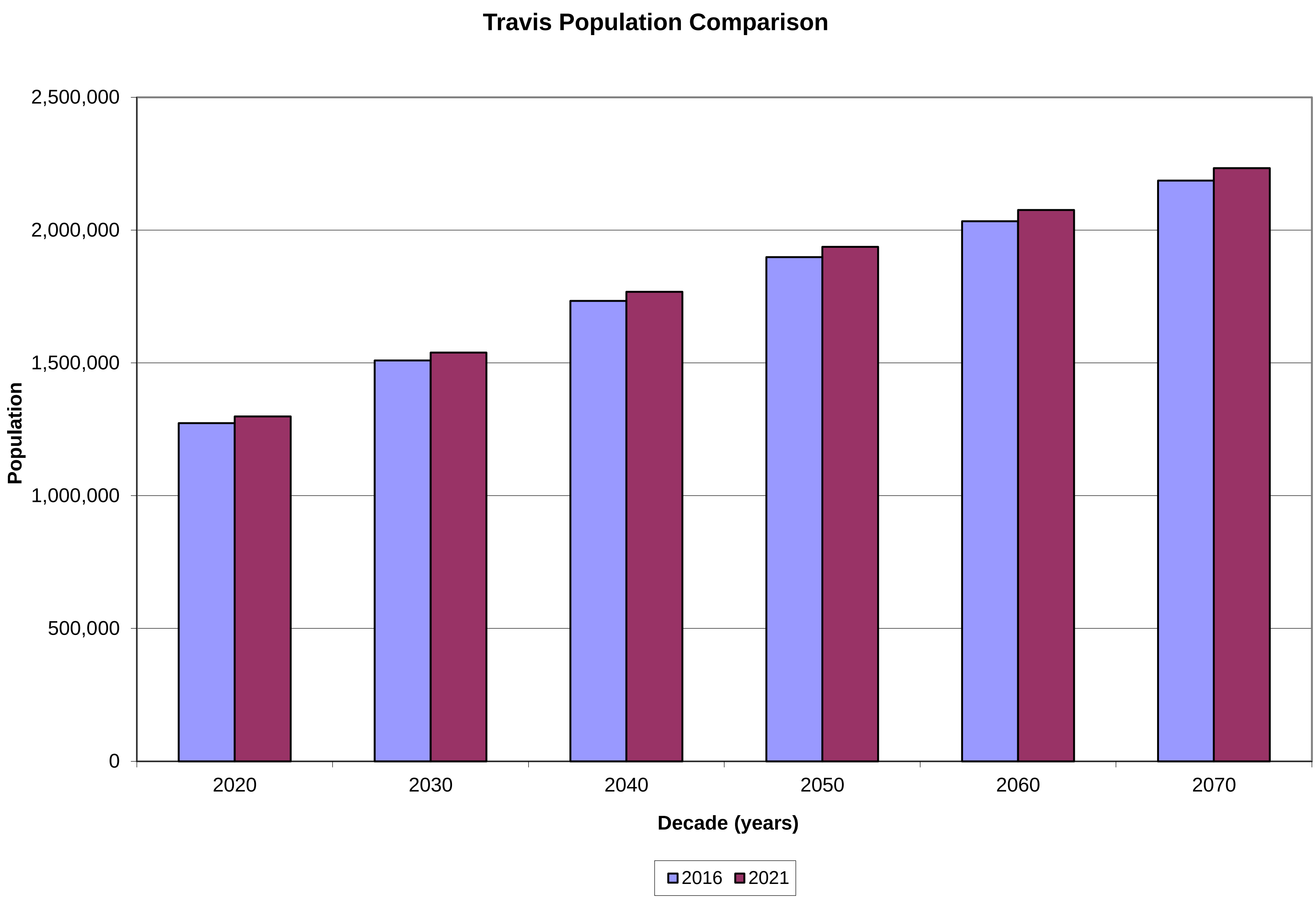
Llano Population Comparison
24,000
23,500
23,000
22,500
22,000
21,500
21,000
20,500
20,000
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

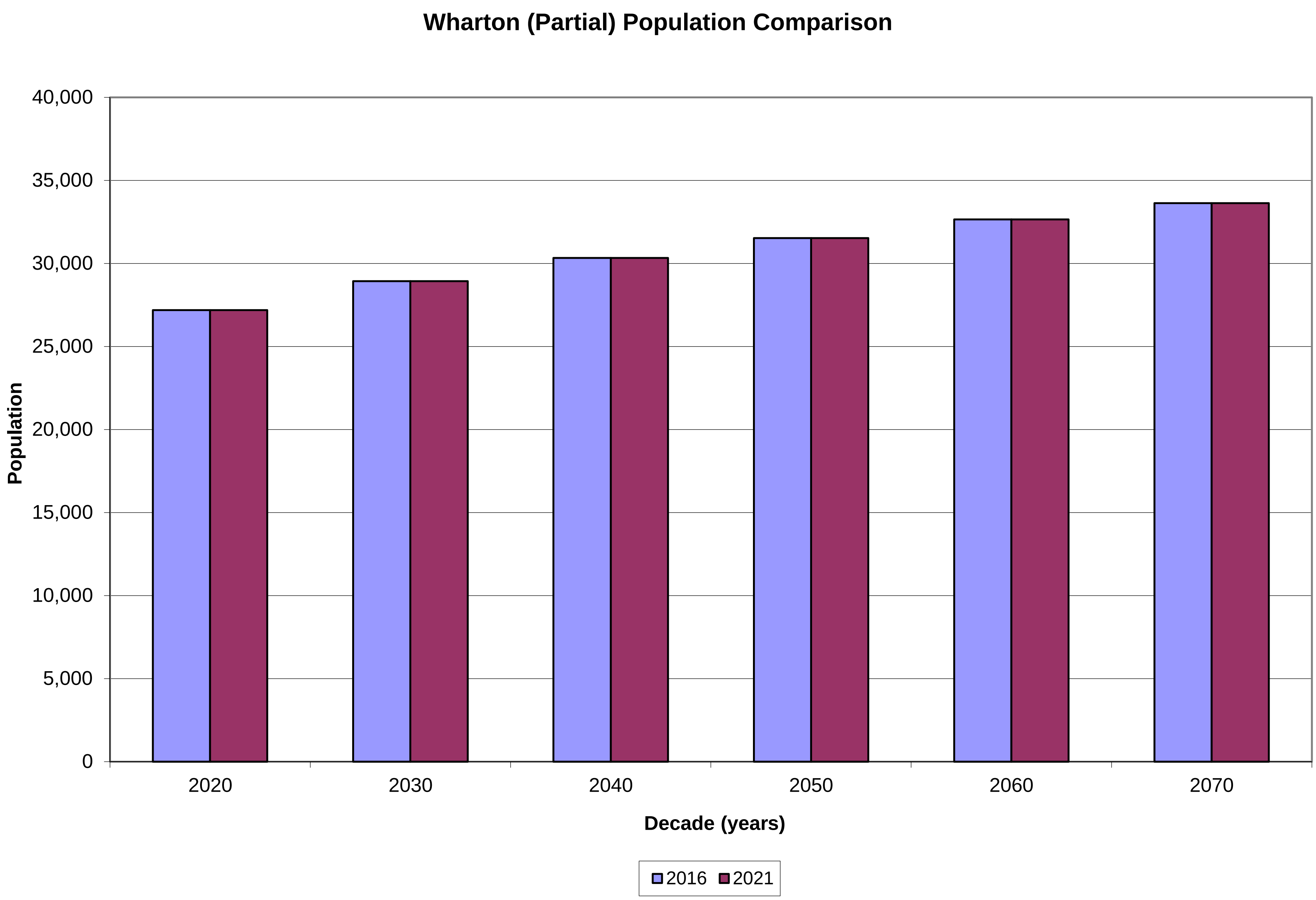

Matagorda Population Comparison
46,000
45,000
44,000
43,000
42,000
41,000
40,000
39,000
38,000
37,000
36,000
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

Mills Population Comparison

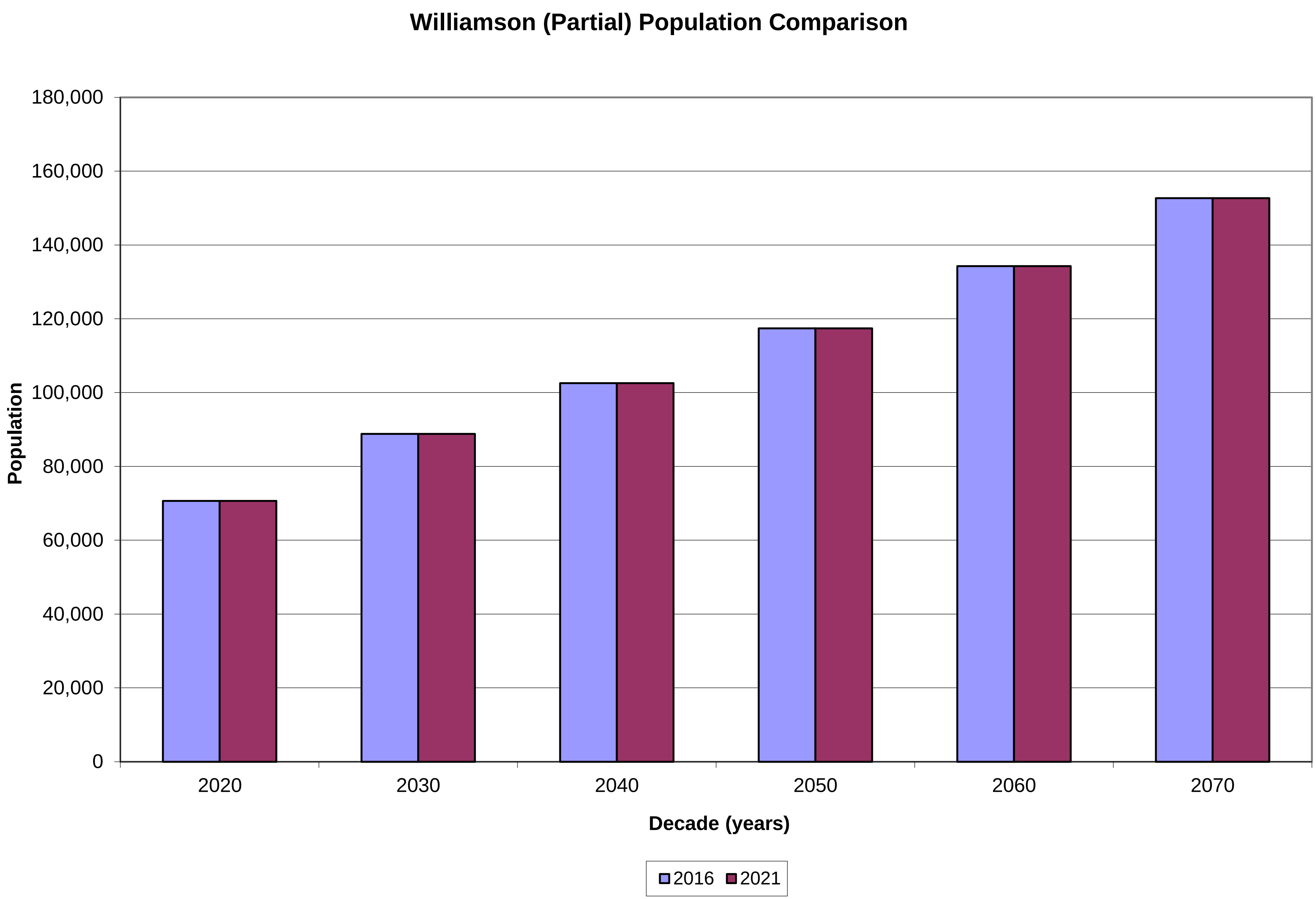



San Saba Population Comparison
Population
7,100
7,000
6,900
6,800
6,700
6,600
6,500
6,400
6,300
6,200
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021


Travis Population Comparison
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



Wharton (Partial) Population Comparison
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



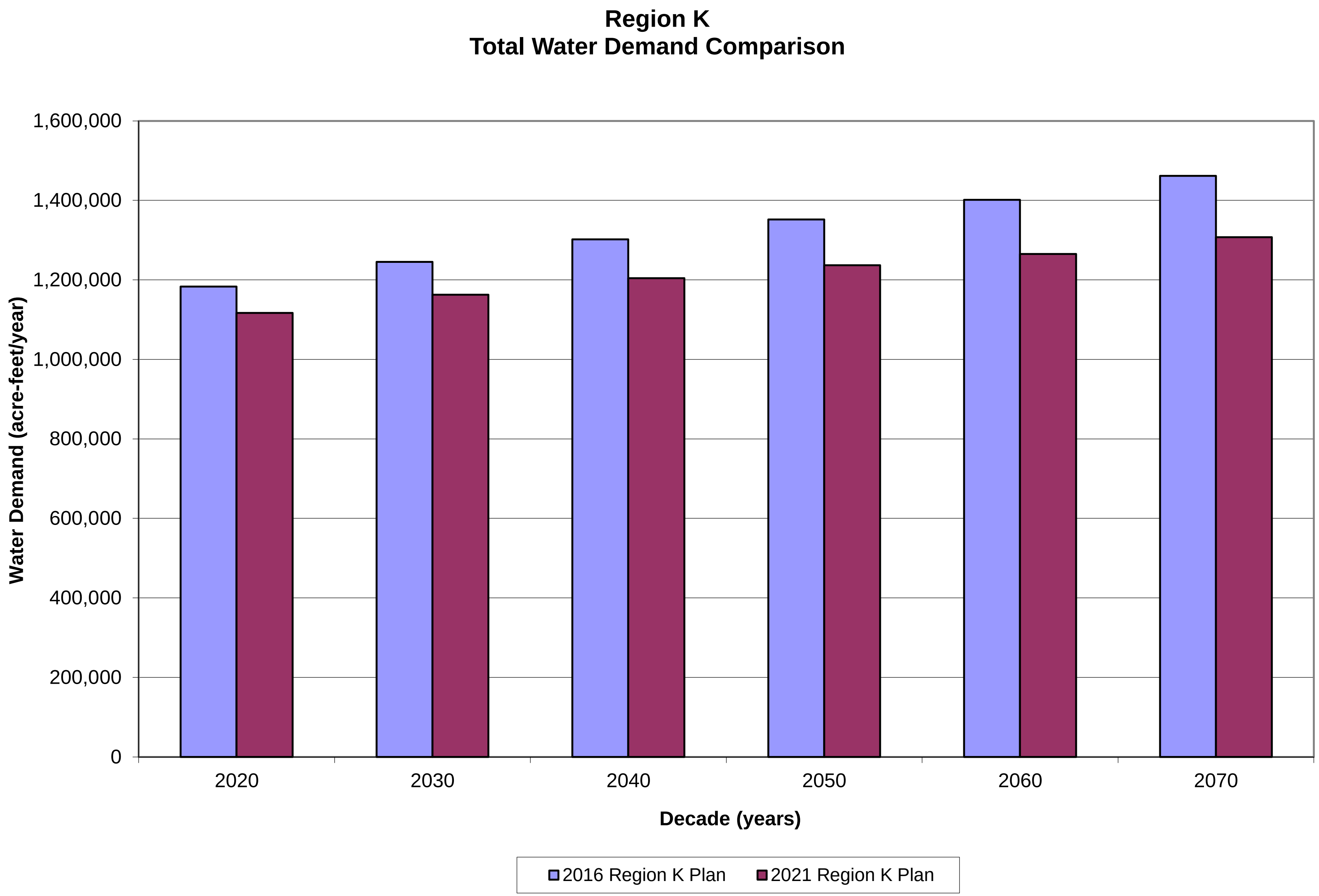
Williamson (Partial) Population Comparison
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Population
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

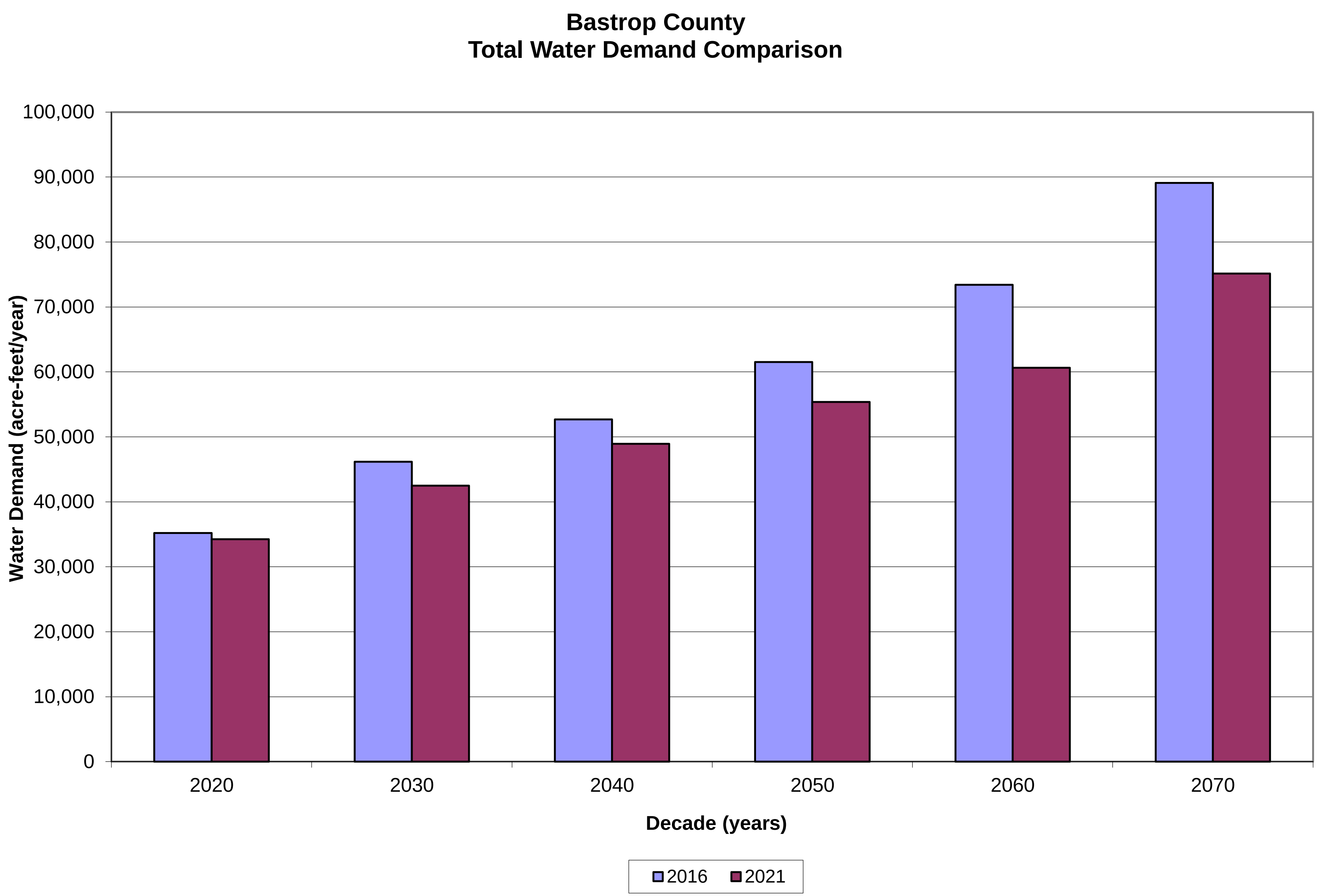
Region K Demand Comparison Between 2021 RWP and 2016 RWP

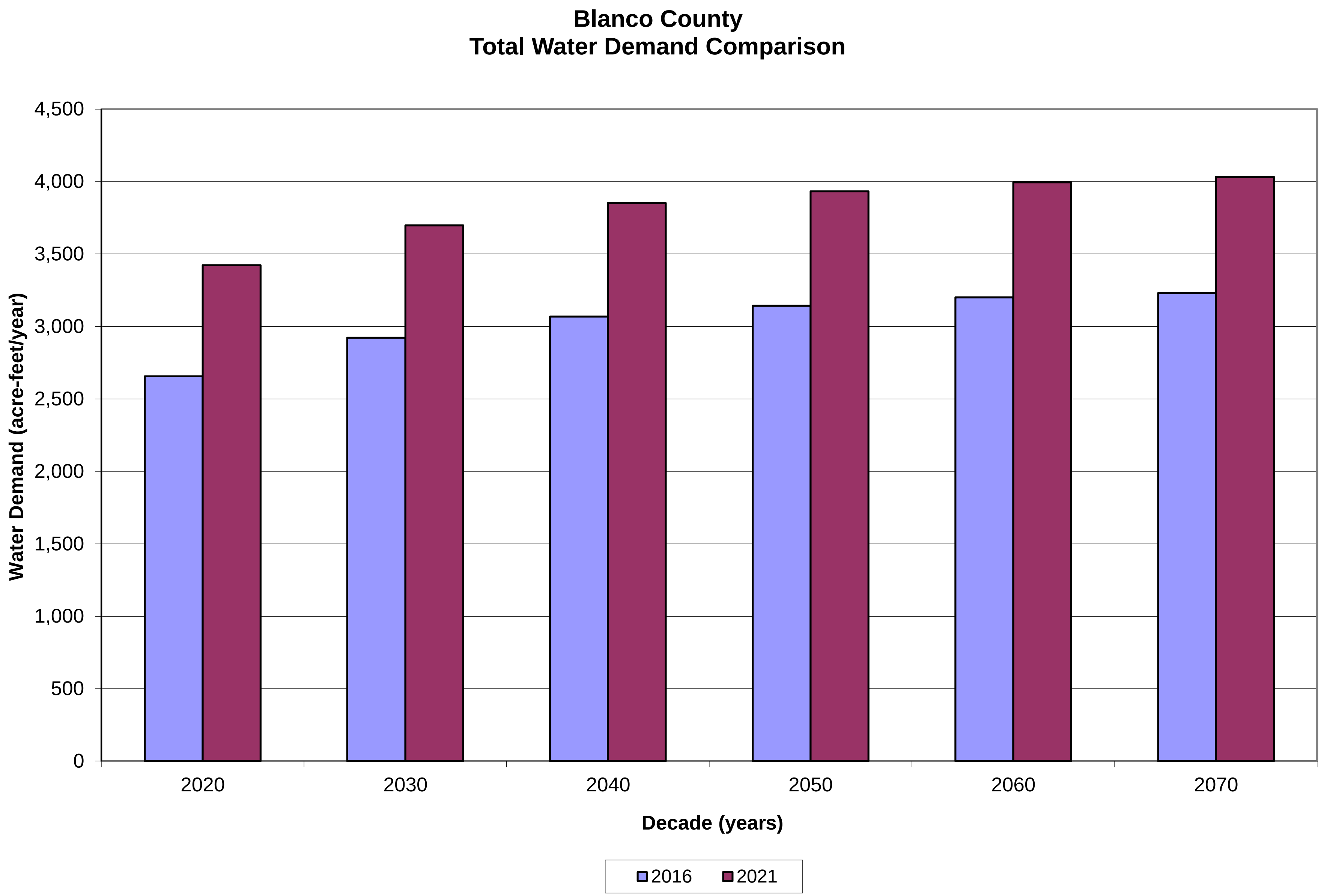
RWP	2020	2030	2040	2050	2060	2070
Municipal						
2021	11,708	14,659	17,013	19,559	22,458	25,644
2016	11,175	13,908	16,147	18,594	21,393	24,472
Difference	533	751	866	965	1,065	1,172
% Change	4.8	5.4	5.4	5.2	5.0	4.8
Livestock						
2021	0	0	0	0	0	0
2016	1	1	1	1	1	1
Difference	-1	-1	-1	-1	-1	-1
% Change	NA	NA	NA	NA	NA	-100.0
Irrigation						
2021	0	0	0	0	0	0
2016	0	0	0	0	0	0
Difference	0	0	0	0	0	0
% Change	NA	NA	NA	NA	NA	NA
Manufacturing						
2021	25	30	30	30	30	30
2016	0	0	0	0	0	0
Difference	25	30	30	30	30	30
% Change	NA	NA	NA	NA	NA	NA
Mining						
2021	5	3	3	3	3	3
2016	5	3	3	3	3	3
Difference	0	0	0	0	0	0
% Change	0.0	0.0	NA	NA	NA	0.0
Steam-Electric Power Generation						
2021	0	0	0	0	0	0
2016	0	0	0	0	0	0
Difference	0	0	0	0	0	0
% Change	NA	NA	NA	NA	NA	#DIV/0!

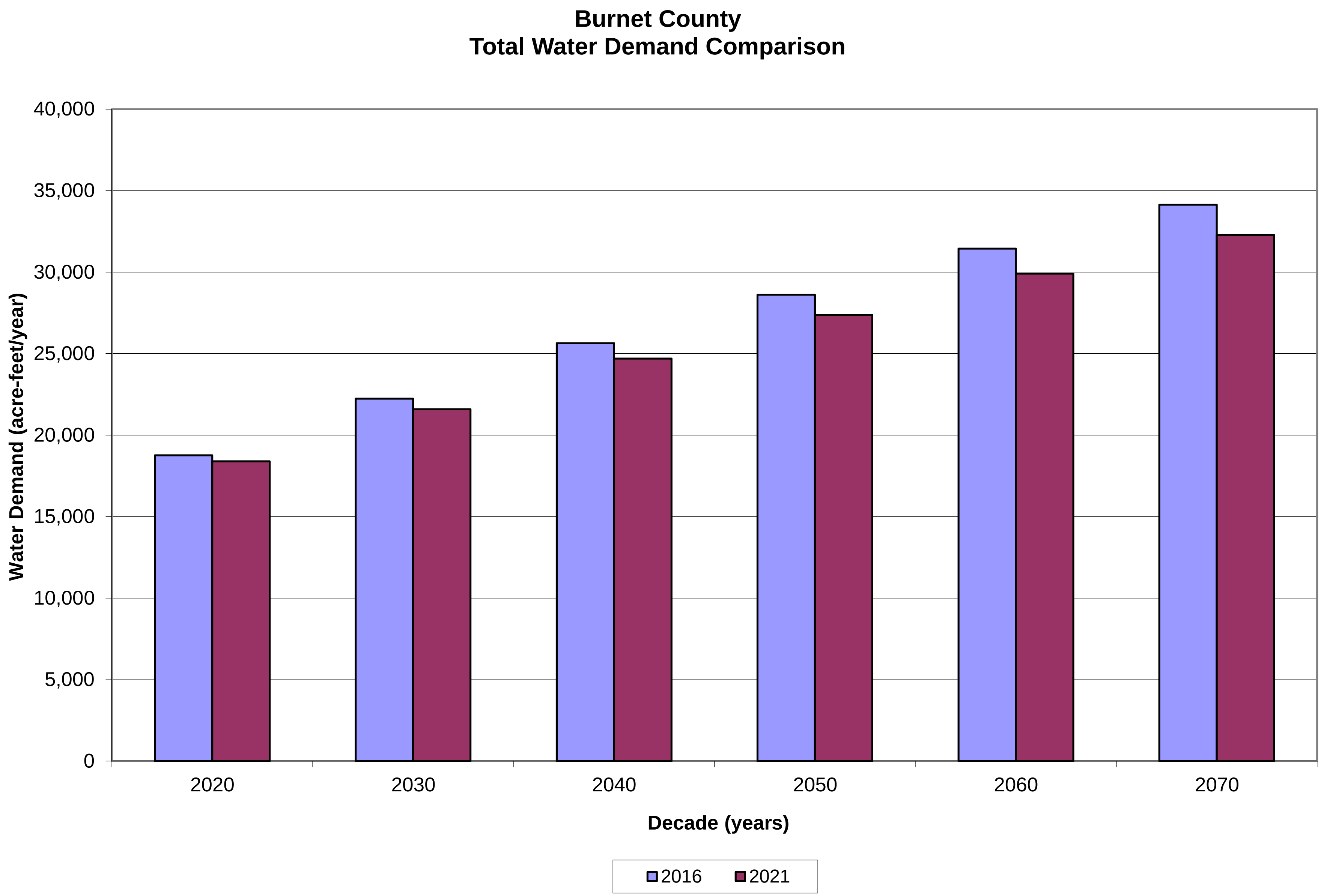
*All values are presented in acre-feet per year

Total Water Demand						
2021	11,738	14,692	17,046	19,592	22,491	25,677
2016	11,181	13,912	16,151	18,598	21,397	24,476
Difference	557	780	895	994	1,094	1,201
% Change	5.0	5.6	5.5	5.3	5.1	4.9

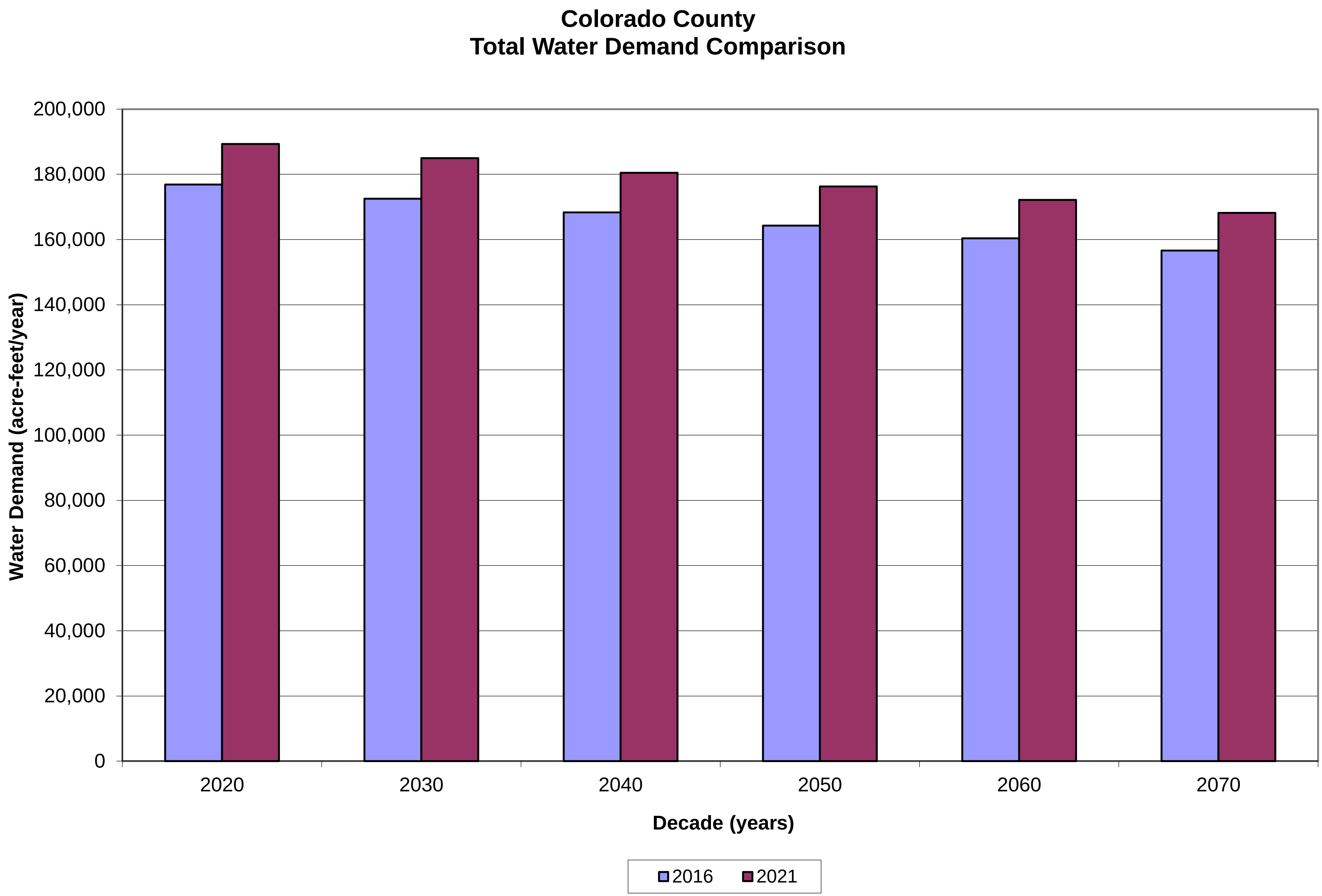

Region K
Total Water Demand Comparison
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016 Region K Plan
2021 Region K Plan


Bastrop County
Total Water Demand Comparison
Water Demand (acre-feet/year)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

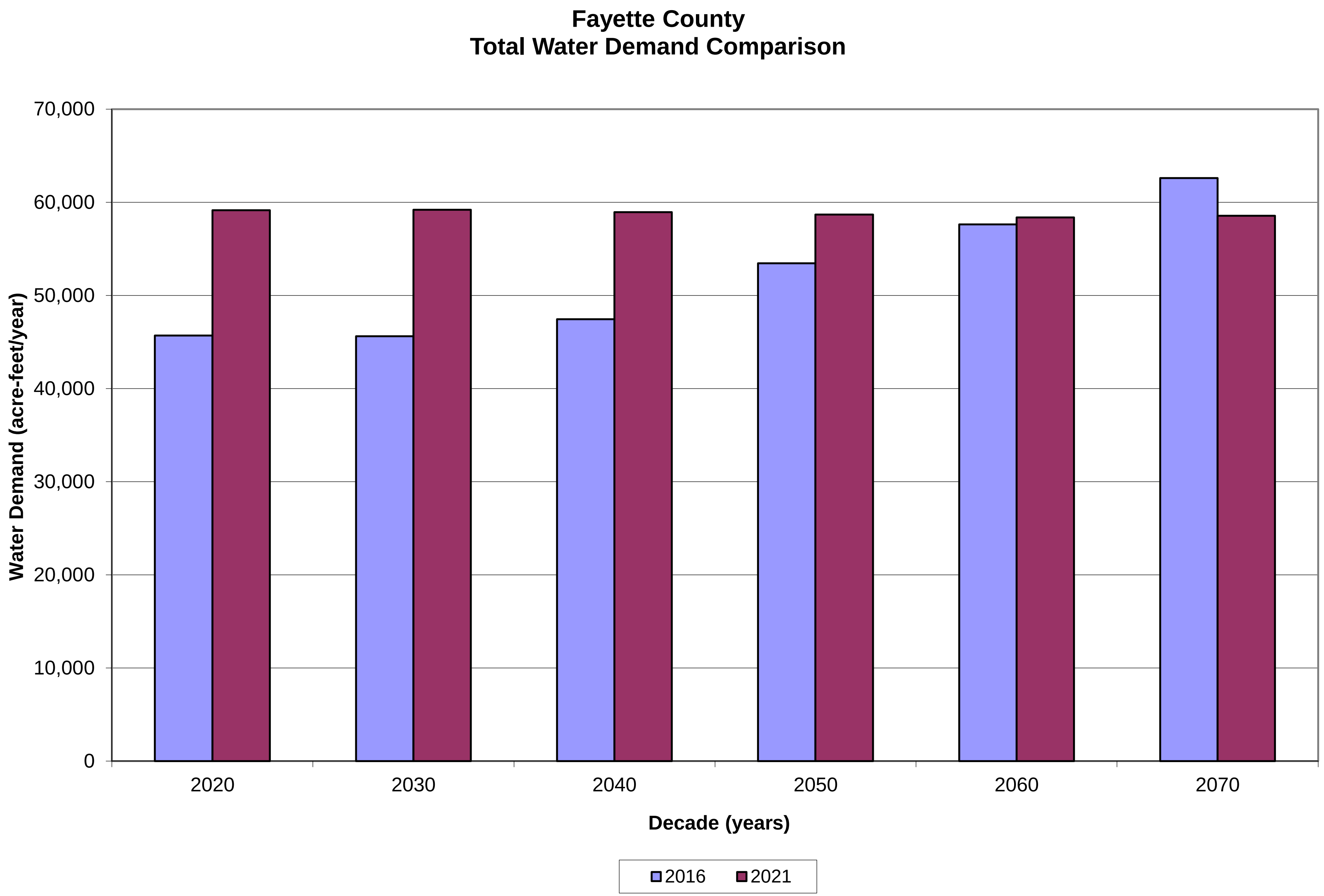

Blanco County
Total Water Demand Comparison
Water Demand (acre-feet/year)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

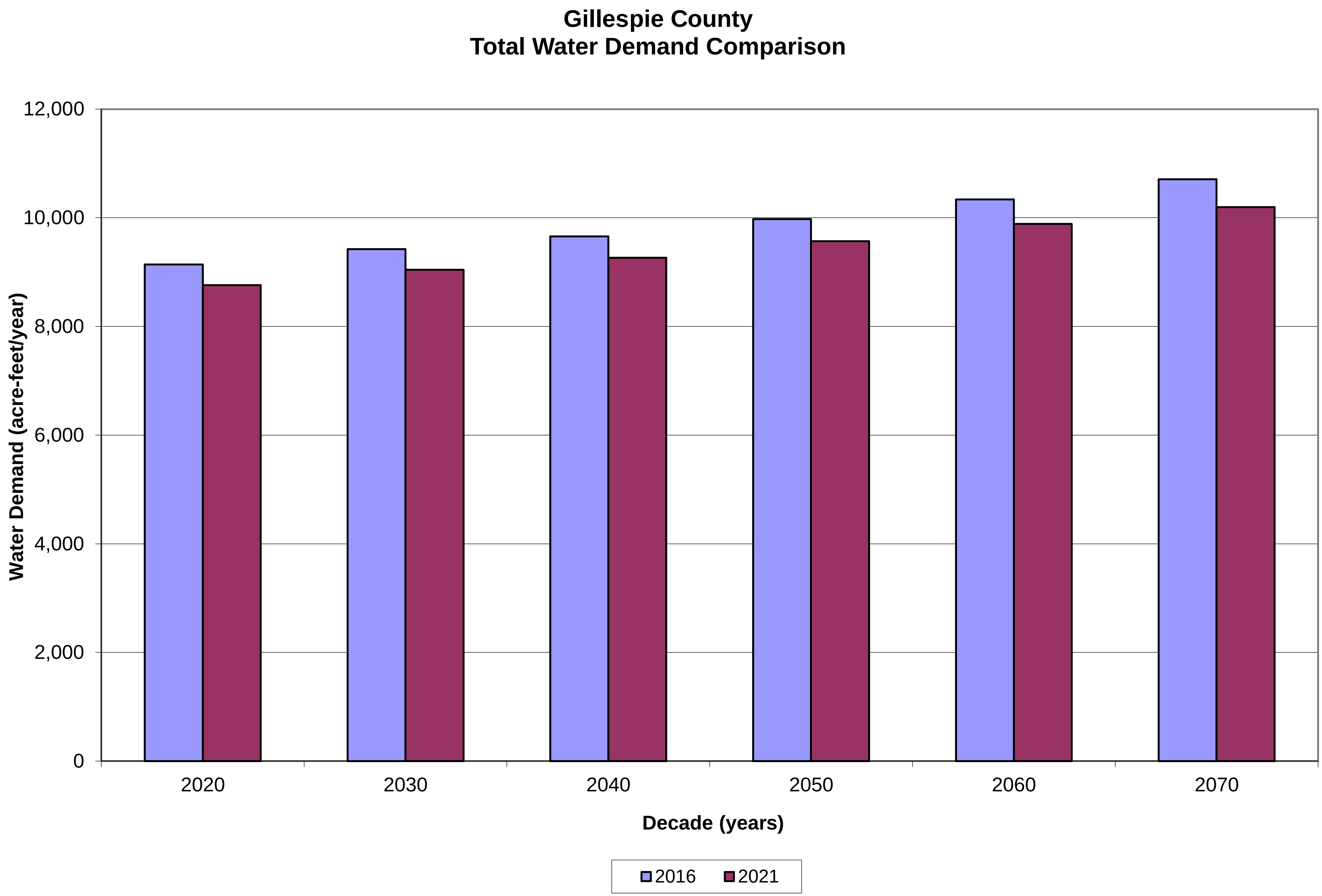


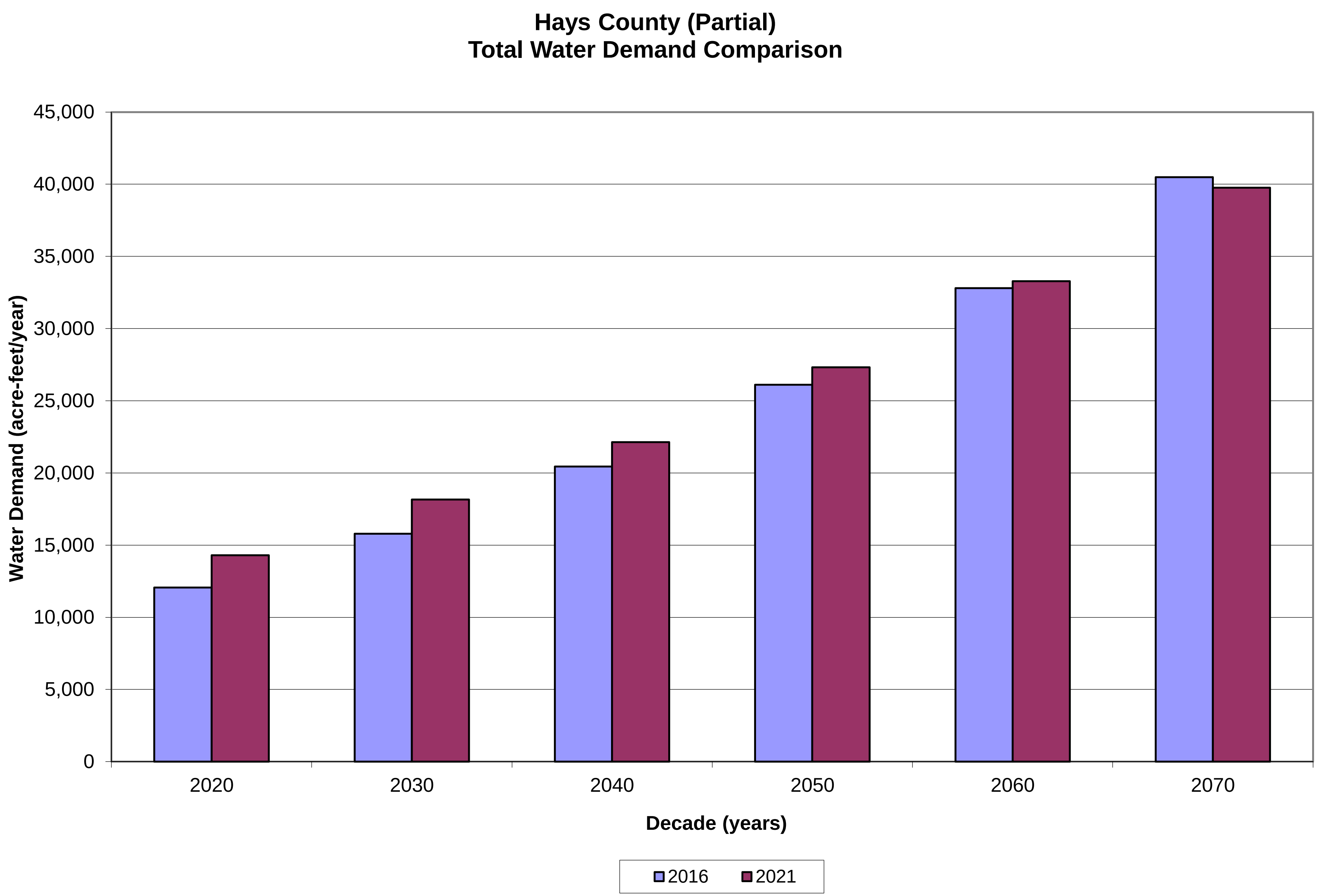
Burnet County
Total Water Demand Comparison
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

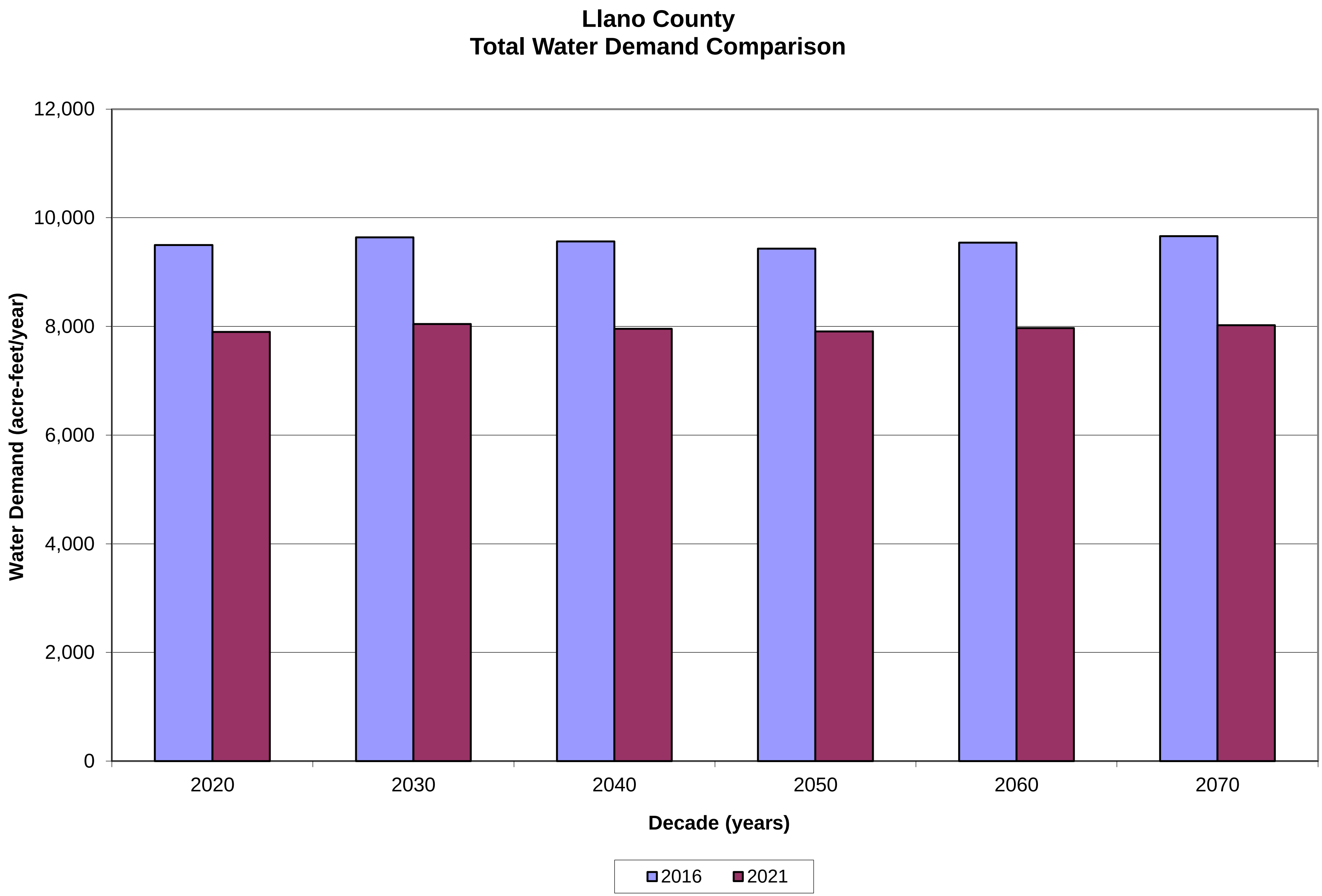


Colorado County
Total Water Demand Comparison
Water Demand (acre-feet/year)
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

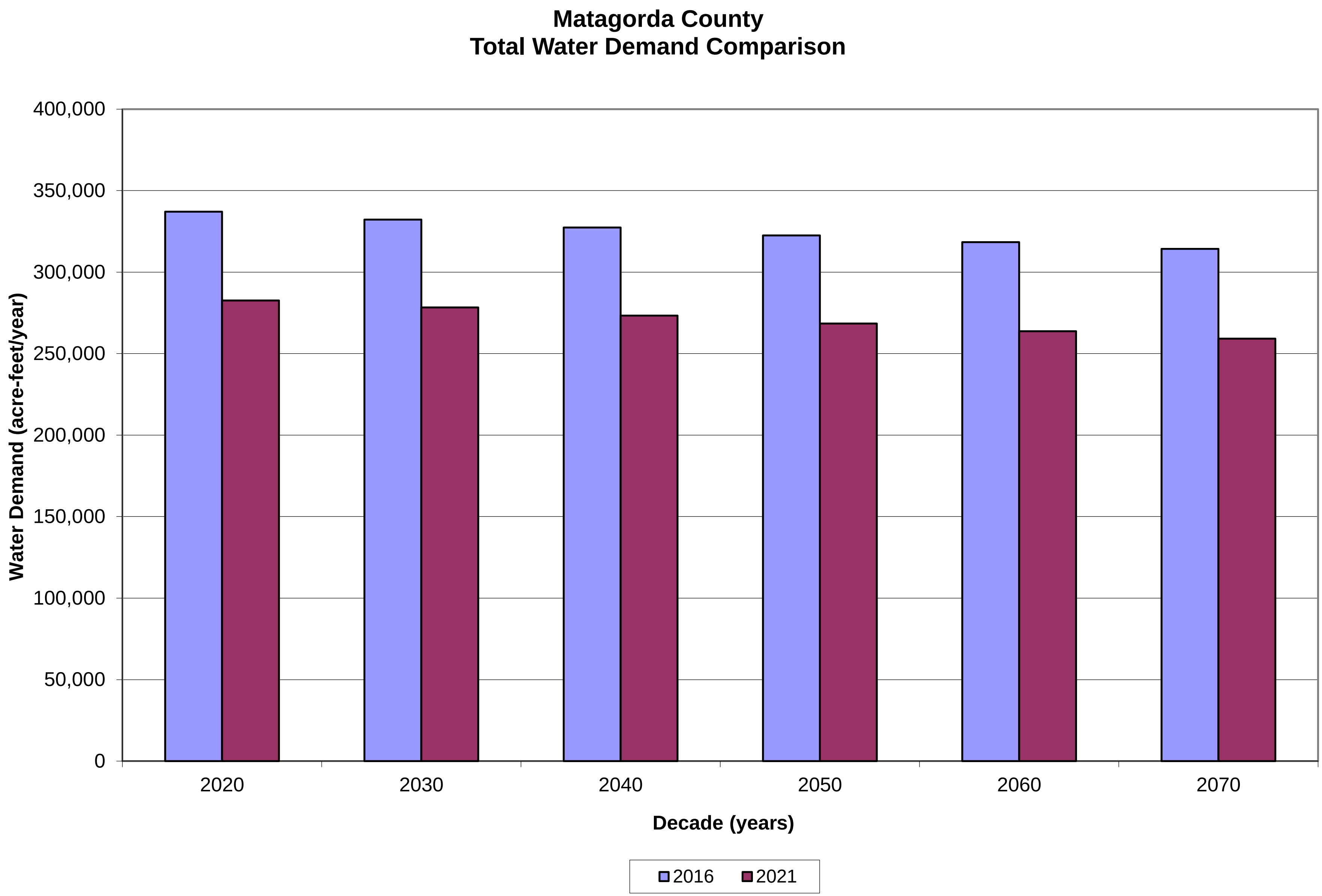

Fayette County
Total Water Demand Comparison
Water Demand (acre-feet/year)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021


Gillespie County
Total Water Demand Comparison
12,000
10,000
8,000
6,000
4,000
2,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

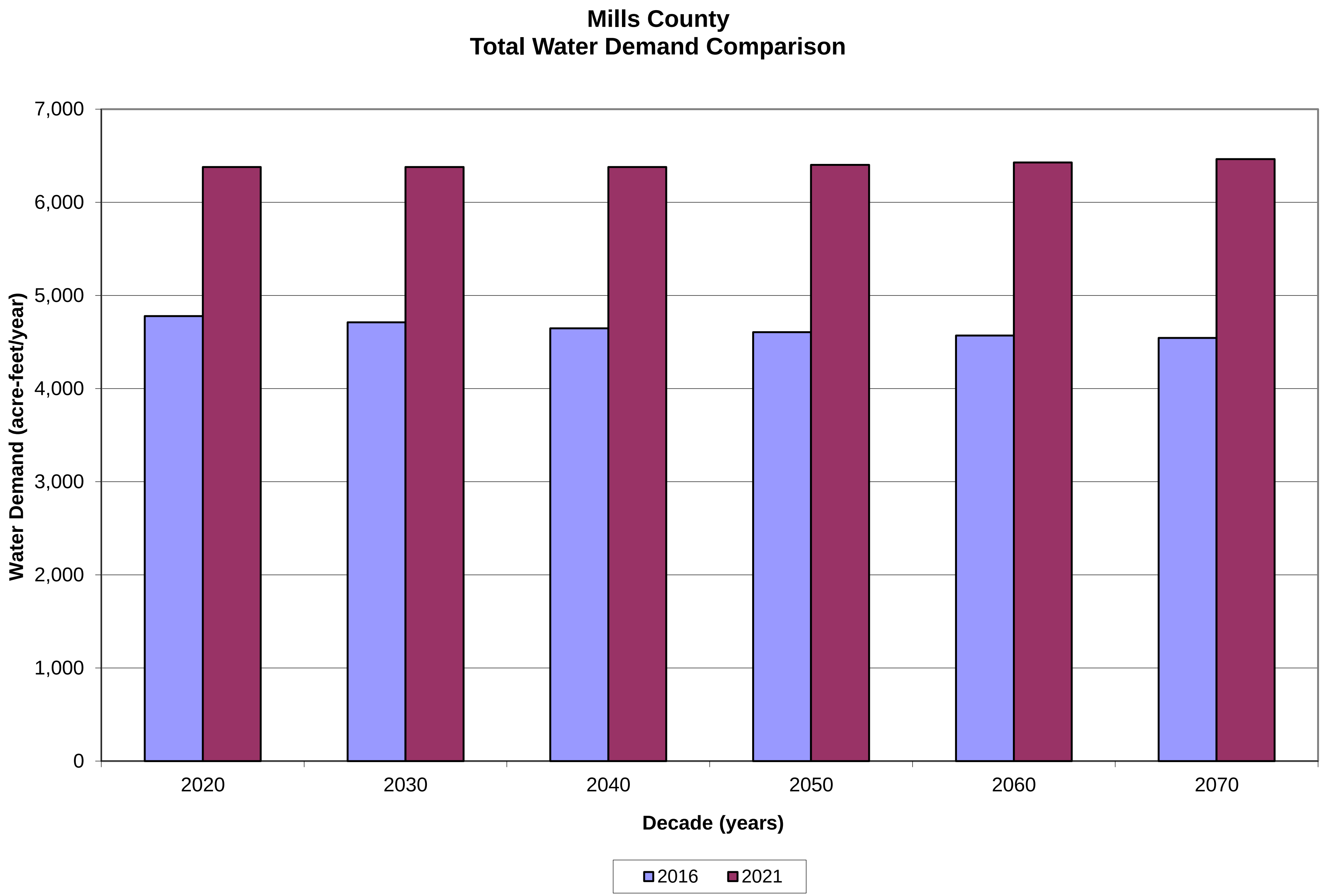

Hays County (Partial)
Total Water Demand Comparison
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



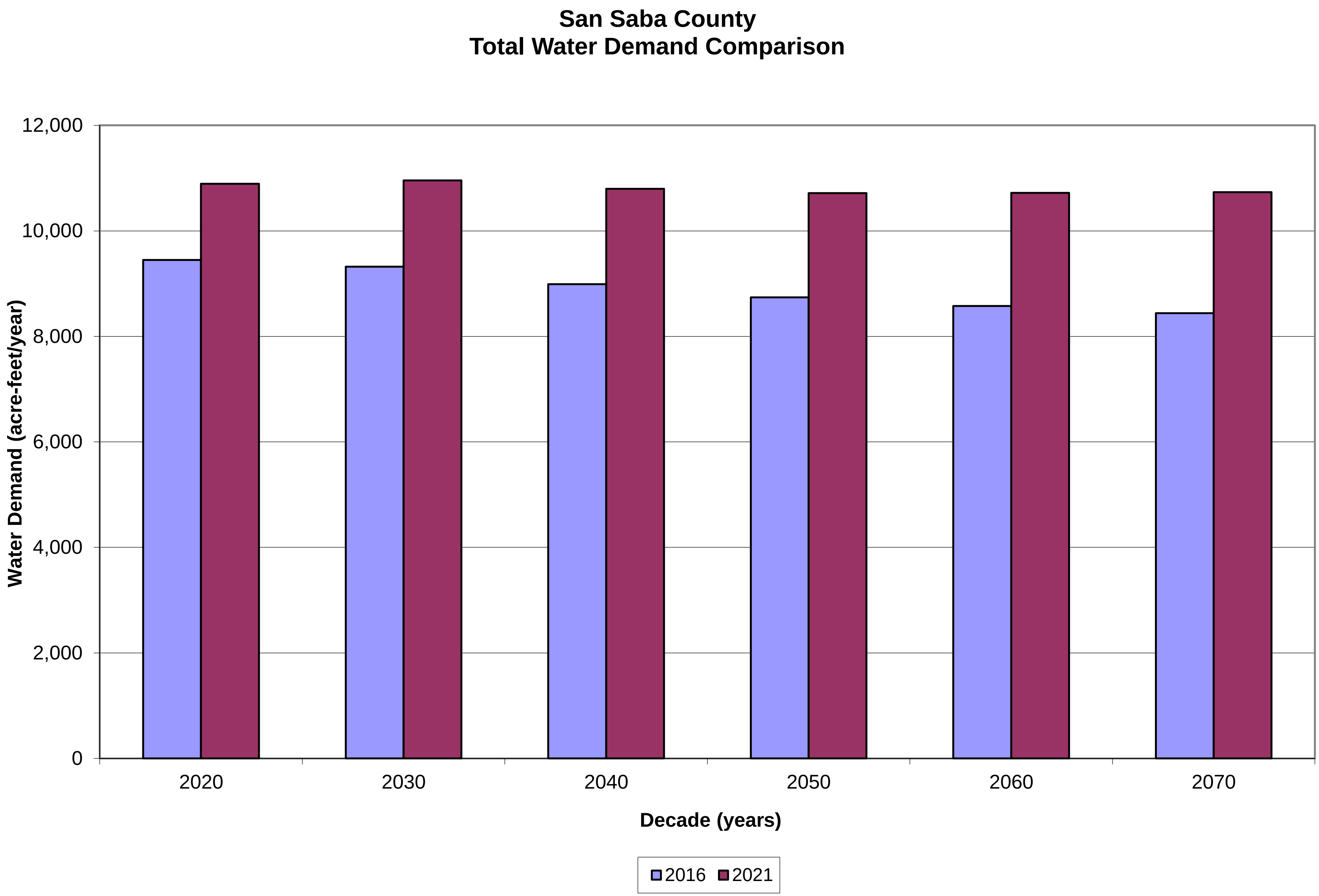
Llano County
Total Water Demand Comparison
12,000
10,000
8,000
6,000
4,000
2,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021

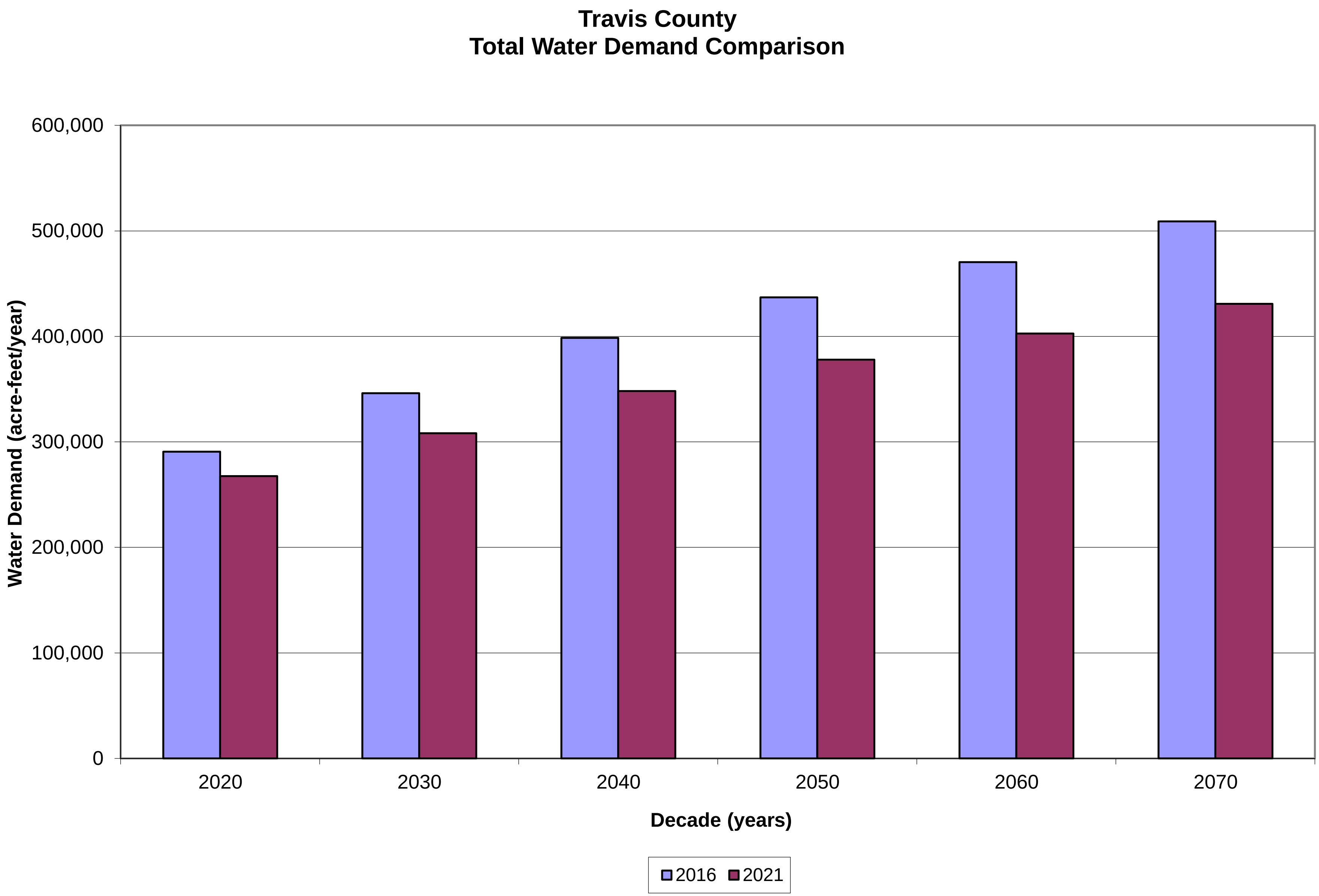


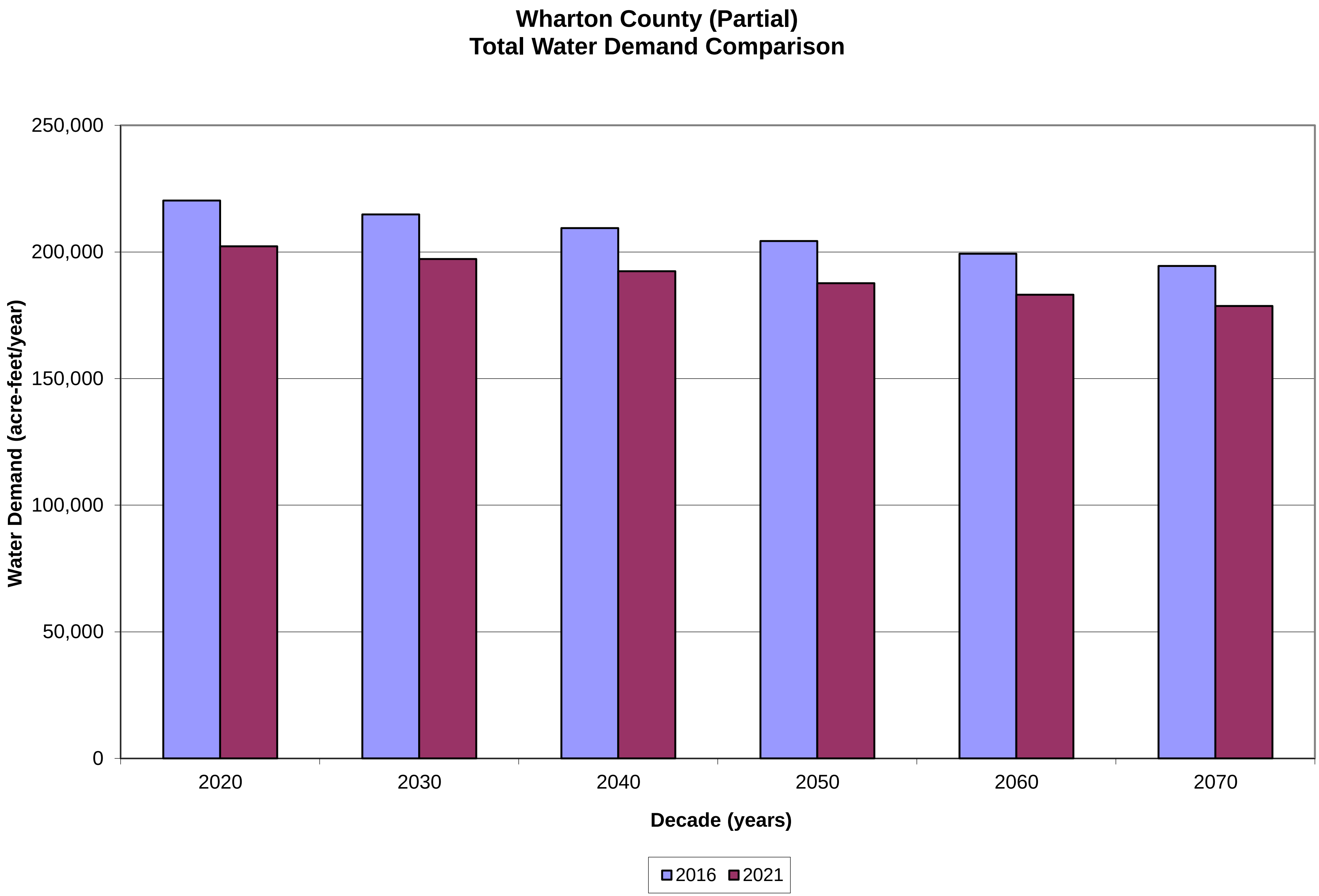
Matagorda County
Total Water Demand Comparison
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



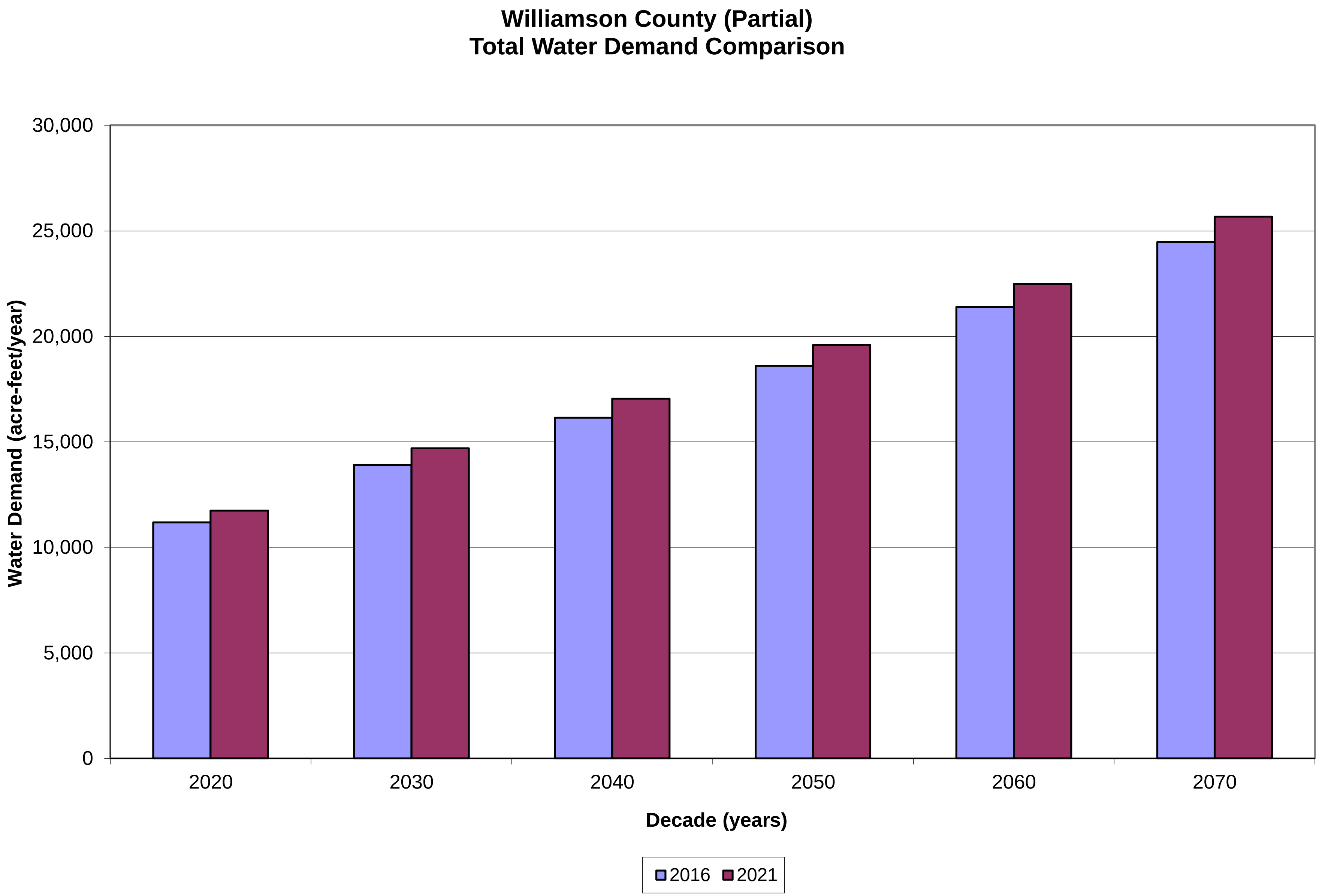
Mills County
Total Water Demand Comparison
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021


San Saba County
Total Water Demand Comparison
Water Demand (acre-feet/year)
12,000
10,000
8,000
6,000
4,000
2,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021


Travis County
Total Water Demand Comparison
600,000
500,000
400,000
300,000
200,000
100,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



Wharton County (Partial)
Total Water Demand Comparison
Water Demand (acre-feet/year)
250,000
200,000
150,000
100,000
50,000
0
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021



Williamson County (Partial)
Total Water Demand Comparison
30,000
25,000
20,000
15,000
10,000
5,000
0
Water Demand (acre-feet/year)
2020
2030
2040
2050
2060
2070
Decade (years)
2016
2021