Barton Springs/Edwards Aquifer Conservation District
Management Plan

Adopted by Board Resolution - October 13, 2022

Approved by TWDB – November 21, 2022

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Barton Springs/Edwards Aquifer Conservation District Management Plan

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1. Introduction

1.1 Purpose of the District Management Plan

The requirement for developing a management plan was first established with the passage of House Bill 162, the landmark legislation commonly referred to as the Underground Water Conservation Act (UWCA), by the 51st Texas Legislature in 1949. The UWCA established the original process for creating and establishing groundwater conservation districts (GCDs) in Texas. House Bill 162, Section 3(c)(B)(8) states that GCDs must "develop comprehensive plans, for the most efficient use of underground waters, and for the control and prevention of waste of such waters; which plans shall specify in such detail as may be possible, the Acts, procedure, performance and avoidances which are or may be necessary for the effectuation of such plans, including specification of engineering operations, and methods of irrigation and to publish such plans and information and bring them to the notice and attention of the owners of land within the district." Thus, even before creation of the first GCD, the need for management plans was established.

Nearly 50 years later, the 75th Texas Legislature in 1997 enacted Senate Bill 1 (SB 1) to establish a new comprehensive statewide water planning process. In particular, SB 1 contained provisions that required GCDs to prepare management plans to identify the water supply resources and water demands that will shape the decisions of each district. Groundwater Conservation Districts are specifically required to develop and adopt management goals, objectives, and performance standards for prescribed efforts such as, but not limited to, providing the most efficient use of groundwater, controlling and preventing the waste of groundwater, and controlling and preventing subsidence within their boundaries.

In 2001, the Texas Legislature enacted Senate Bill 2 (SB 2) to build on the planning requirements of SB 1 and to further clarify the actions necessary for GCDs to manage and conserve the groundwater resources of the state of Texas. The Texas Legislature enacted significant changes to the management of groundwater resources in Texas with the passage of House Bill 1763 (HB 1763) in 2005. HB 1763 created a long-term planning process in which GCDs within each Groundwater Management Area (GMA) are required to meet and determine the Desired Future Conditions (DFCs) for the groundwater resources within their GMA boundaries by September 1, 2010. In addition, SB 660 in 2011 amended the Texas Water Code to require that GCDs in a common GMA share and review management plans with the other GCDs in the GMA to facilitate coordinated groundwater management. The Barton Springs/Edwards Aquifer Conservation District's (District) management plan satisfies the requirements of SB 1, SB 2, HB 1763, the statutory requirements of Chapter 36 of the Texas Water Code (TWC), and the administrative requirements of the Texas Water Development Board's (TWDB) rules.

1.2 Time Period of the District Management Plan

The time period for this management plan is five years from the date of approval by the TWDB. Although the District must review and readopt the plan at least once every five years, it is not restricted from doing so more frequently if deemed appropriate by the District. In accordance with the provisions of Chapter 36 of the TWC, this management plan (Plan) will be reviewed, updated, and readopted at least once every five years as the District develops site-specific data on local groundwater use and aquifer conditions and as the key management strategies are developed and the overall management approach evolves. Once adopted, this Plan will remain in effect until it is replaced by a revised management plan approved by the TWDB.

This Plan incorporates relevant regional water management strategies outlined in the current (2021) Regional Water Plans developed by the Lower Colorado Regional Planning Group and the South Central Texas Regional Planning Group, and included in the 2022 State Water Plan (SWP), "Water for Texas" (TWDB 2022). Population and water demand projections cover the 50-year period from 2020 to 2070 and are consistent with those used by the TWDB for this area in statewide water planning.

1.3 Background

Authority and Purpose

The District was created in 1987 by the 70th Texas Legislature, under Senate Bill 988. Its statutory authorities include Chapter 52 (later revised to TWC, Chapter 36), applicable to all GCDs in the state, and the District's enabling legislation, now codified as Chapter 8802, Special District Local Laws Code. The District's legislative mandate is to conserve, protect, and enhance the groundwater resources located within the District boundaries. The District has the power and authority to undertake various studies, assess fees on groundwater pumpage and transport, and to implement structural facilities and non-structural programs to achieve its statutory mandate. The District has rulemaking authority to implement its policies and procedures and to help ensure the management of groundwater resources as directed by the Board. The District is not a taxing authority. Its only sources of income are groundwater production fees, the annual City of Austin water use fee, export fees, administrative fees, and occasional grants from various local, state, and federal programs for special projects.

Jurisdictional Area

Upon creation in 1987, the District's jurisdictional area encompassed approximately 255 square miles including parts of four counties: northwestern Caldwell, northeastern Hays, southeastern Travis Counties, and a small territory in western Bastrop County (in 2011, that small part of Bastrop County was de-annexed from the District and is now in Lost Pines GCD's sole jurisdiction). The jurisdictional area was generally defined to include all the area within the Barton Springs segment of the Edwards Aquifer with an extended area to the east to incorporate the service areas of the Creedmoor-Maha Water Supply Corporation, Goforth Special Utility District, and Monarch Utilities. In this area, designated as the "Exclusive Territory," the District has authority over all groundwater resources.

In 2015, the 84th Texas Legislature (House Bill 3405) expanded the District's jurisdictional area to include the portion of Hays County located within the boundaries of the Edwards Aquifer Authority (EAA) excluding the overlapping area in the Plum Creek Conservation District (see Figures 1-1 and 1-2). The newly annexed area, designated as "Shared Territory," excludes the Edwards Aquifer and includes all other aquifers, including the underlying Trinity Aquifer. The District's jurisdictional area including the Shared Territory encompasses approximately 420 square miles and includes both urban and rural areas. The District shares boundaries with adjacent GCDs to the west, south, and east including the Hays Trinity GCD, Comal Trinity GCD, EAA, Plum Creek GCD, and Lost Pines GCD respectively (see Figure 1-2). The District participates in joint-regional planning with these and other GCDs in GMA 10 which is configured generally to encompass the Trinity and Edwards aquifers (see Figure 1-3).

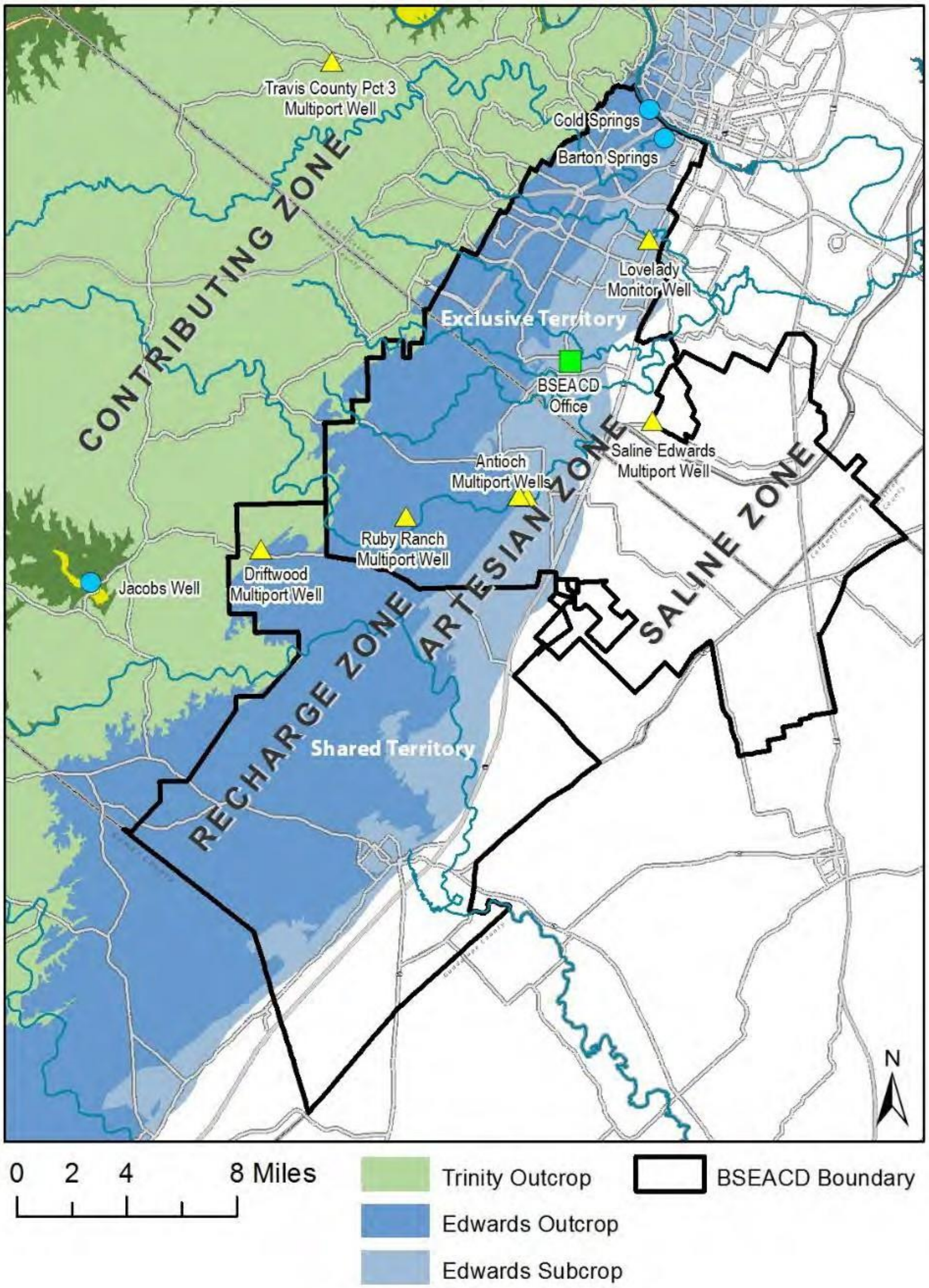


FIGURE 1-1. LOCATION OF THE BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT ALONG WITH MAJOR AQUIFERS, HYDROGEOLOGIC ZONES, MONITORING WELLS, AND SPRINGS.

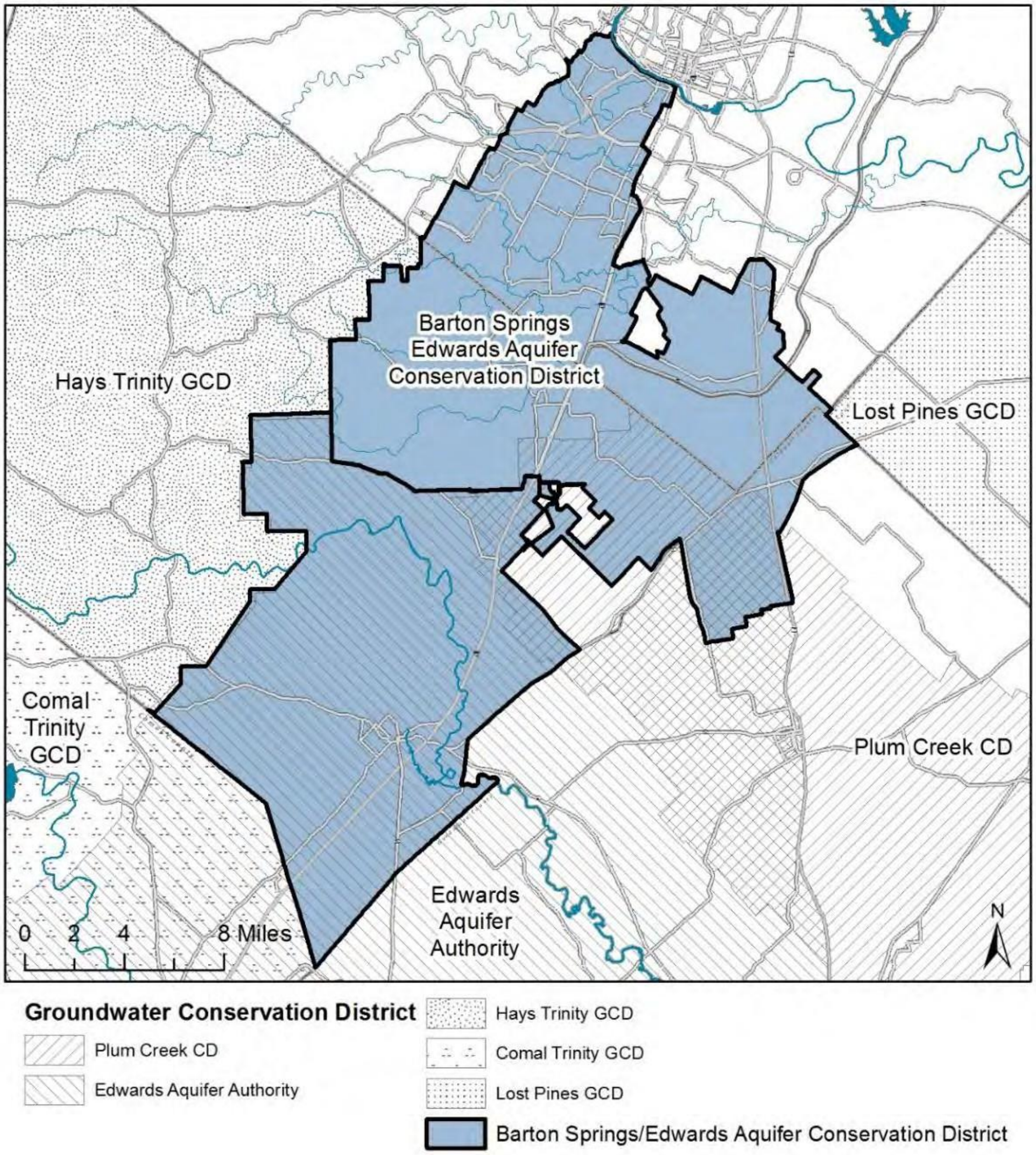


FIGURE 1-2. OTHER GROUNDWATER CONSERVATION DISTRICTS ADJACENT TO THE DISTRICT

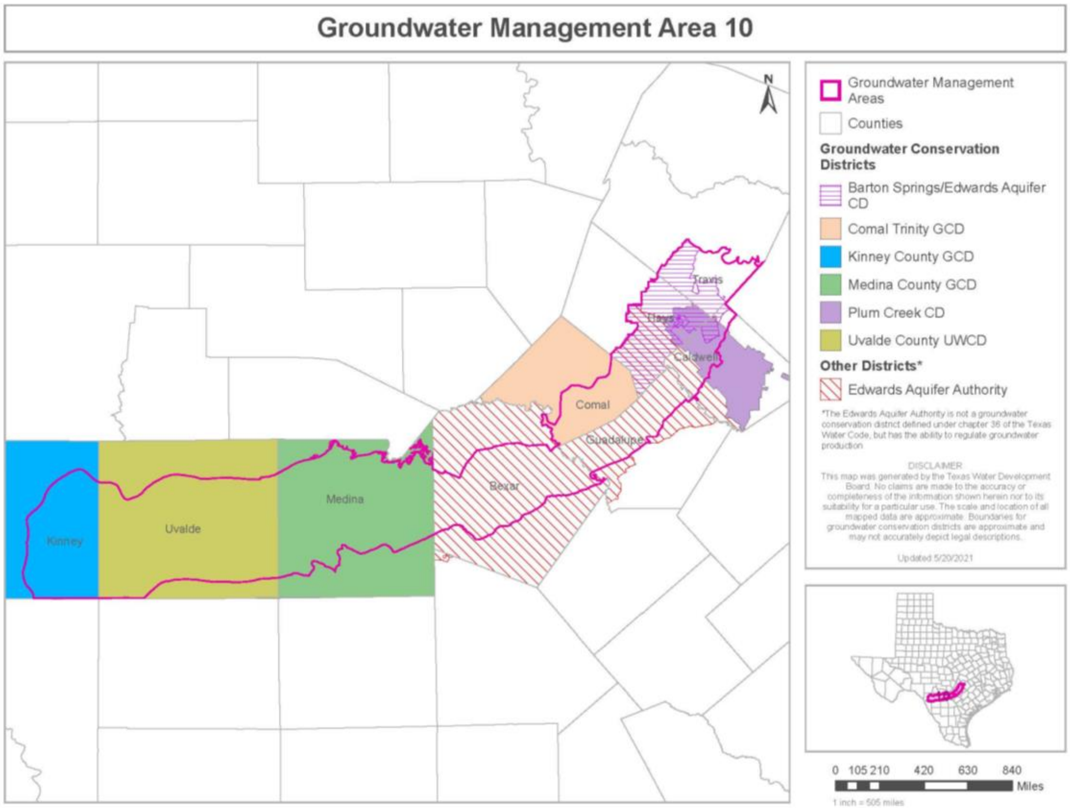


FIGURE 1-3. LOCATION OF THE GCDs within GMA 10 (TWDB 2021).

Aquifers and Uses

Water from the Barton Springs segment of the Edwards Aquifer serves as the primary water source for public water supply, industrial, and commercial purposes in the District and is a major source of high quality base flow to the Colorado River via discharge through the Barton Springs complex. The Barton Springs complex provides habitat for the Barton Springs salamander (*Eurycea sosorum*) and Austin blind salamander (*Eurycea waterlooensis*). Both salamanders are federally listed endangered species under the Endangered Species Act requiring all activities that would or could adversely affect the species to represent optimal conservation efforts. The Trinity Aquifer, underlying the Edwards, is an important primary water resource in some parts of the District and is increasingly being developed in both the Exclusive and Shared Territory. Some wells in the District also produce water from the Taylor and Austin Chalk formations as well as various alluvial deposits along river and stream banks.

The area has a long history of farming, ranching, and rural domestic use of groundwater, but it is increasingly and rapidly being converted to residential use owing to suburban and exurban development from Austin and San Marcos. Groundwater in the area is primarily utilized for p ublic water supply purposes with irrigation agriculture being the second largest use type. Lesser amounts of groundwater are used for commercial, industrial, and domestic (i.e., private well) use types. Figure 1-4 illustrates the relative use of groundwater for the most recent fiscal year, 2022.

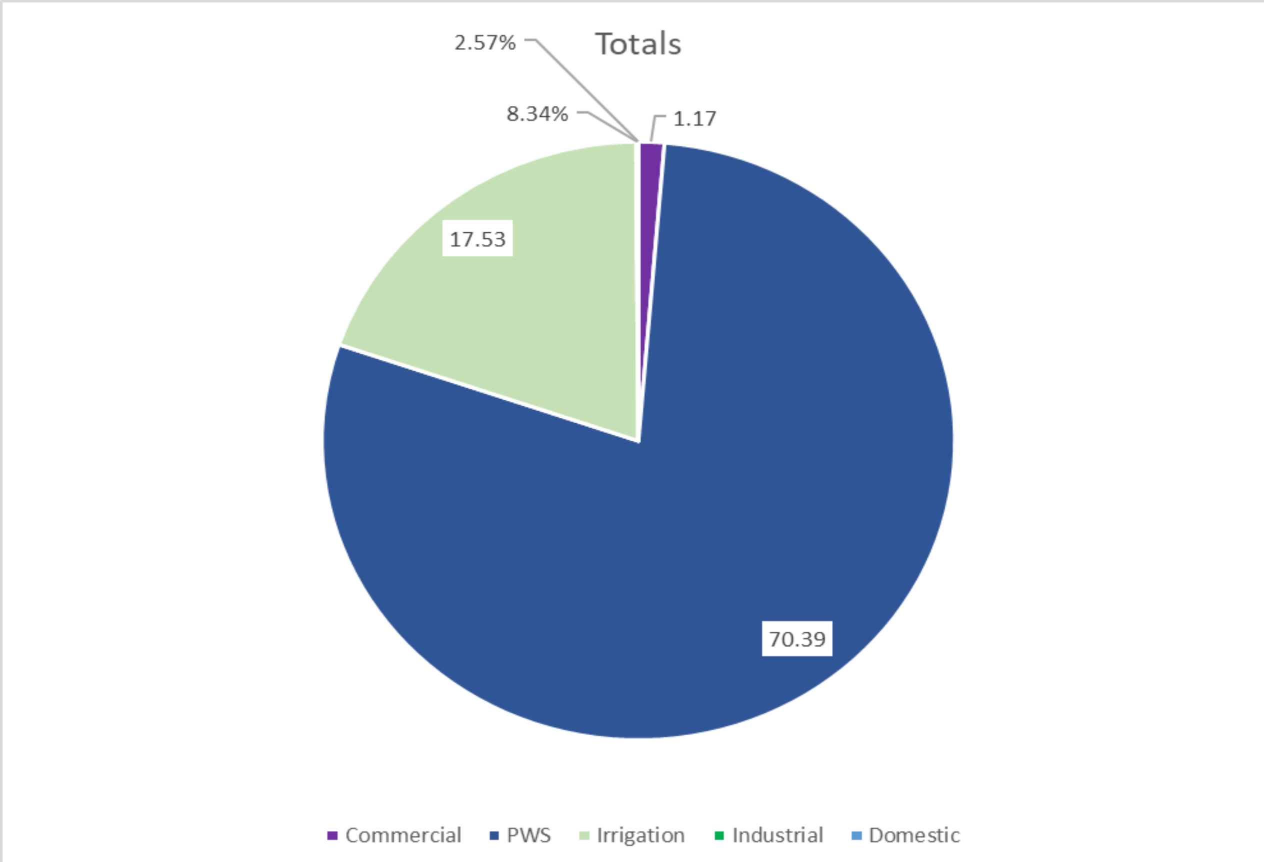


FIGURE 1 -4. TYPES OF GROUNDWATER USE AND THEIR PERCENT OF AUTHORIZED USE FOR PERMITTED WELLS IN THE DISTRICT

Governance

A five-member Board of Directors ("Board") governs the District. The Directors are elected on the November general election date in even-numbered years to staggered four-year terms from the five single-member precincts that comprise the District (see Figure 1-5). Each Director represents a precinct of which two (Precincts 4 and 5) are comprised of territory within or surrounded by the City of Austin as required by the District's enabling legislation. The other three precincts (Precincts 1, 2, and 3) represent the remaining area including the Shared Territory.

The Board sets policies and adopts rules and bylaws to operate the District and takes action in accordance with the Rules and Bylaws in executing the District's mission. The general manager reports to and is directed by the Board and is responsible for the overall operations and day-to-day activities of the District including programmatic planning and administration, stakeholder relations and regional planning, staff management and development, and financial administration.

While the area of the District is very small in comparison to other GCDs, its demographics have produced a rather complex set of legislative districts. Each of the State Senators and State Representatives that share constituencies with the District, as shown in Figures 1-6 and 1-7, represents a differing set of legislative priorities, yet each of them has expressed strong support for groundwater management, either on a general or a specific-issue basis.

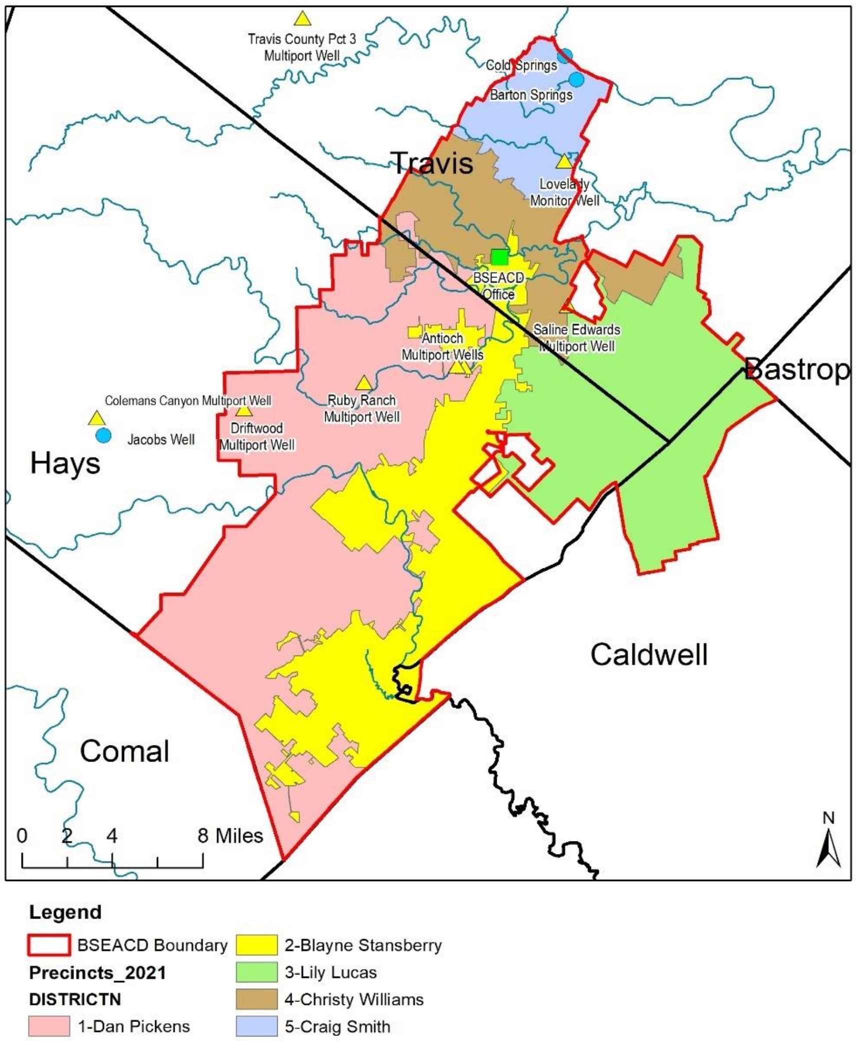


FIGURE 1-5. BSEACD DIRECTOR PRECINCTS

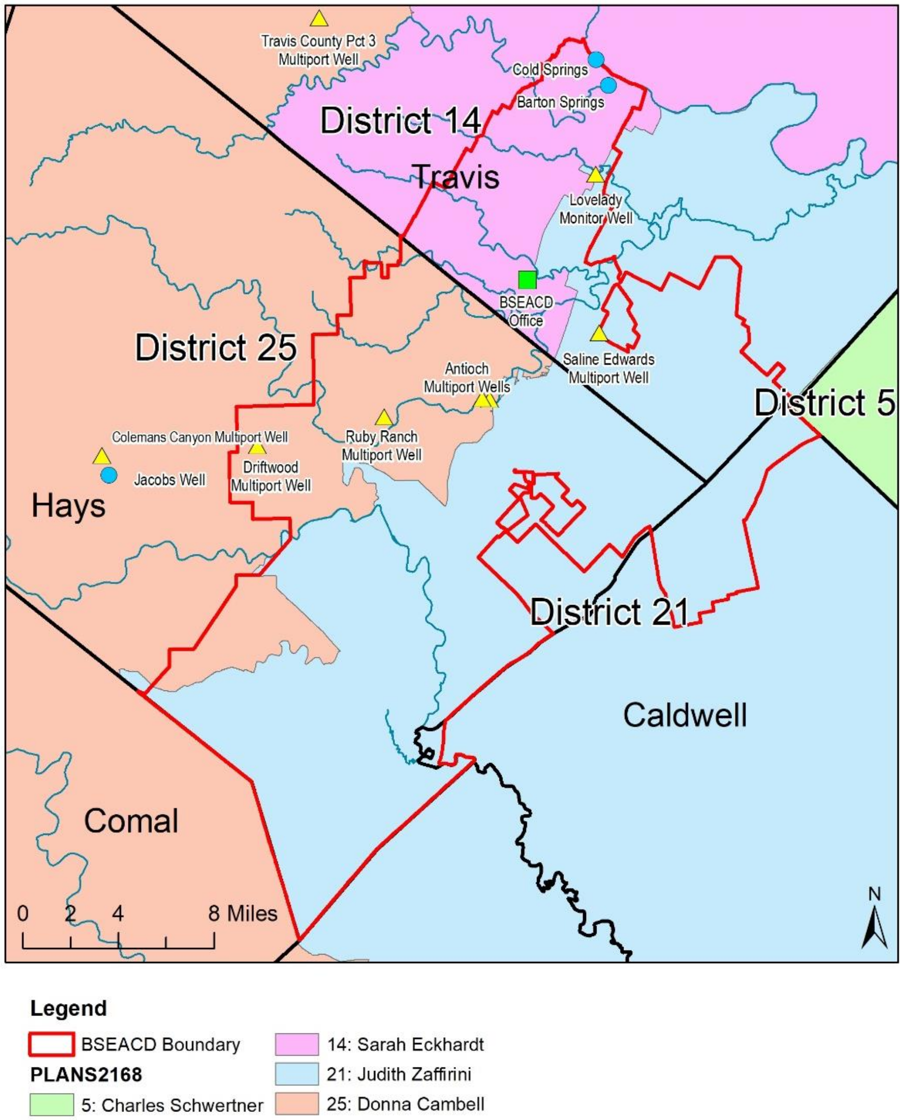


FIGURE 1-6. SENATE DISTRICTS WITHIN OR ADJACENT TO THE DISTRICT'S BOUNDARY

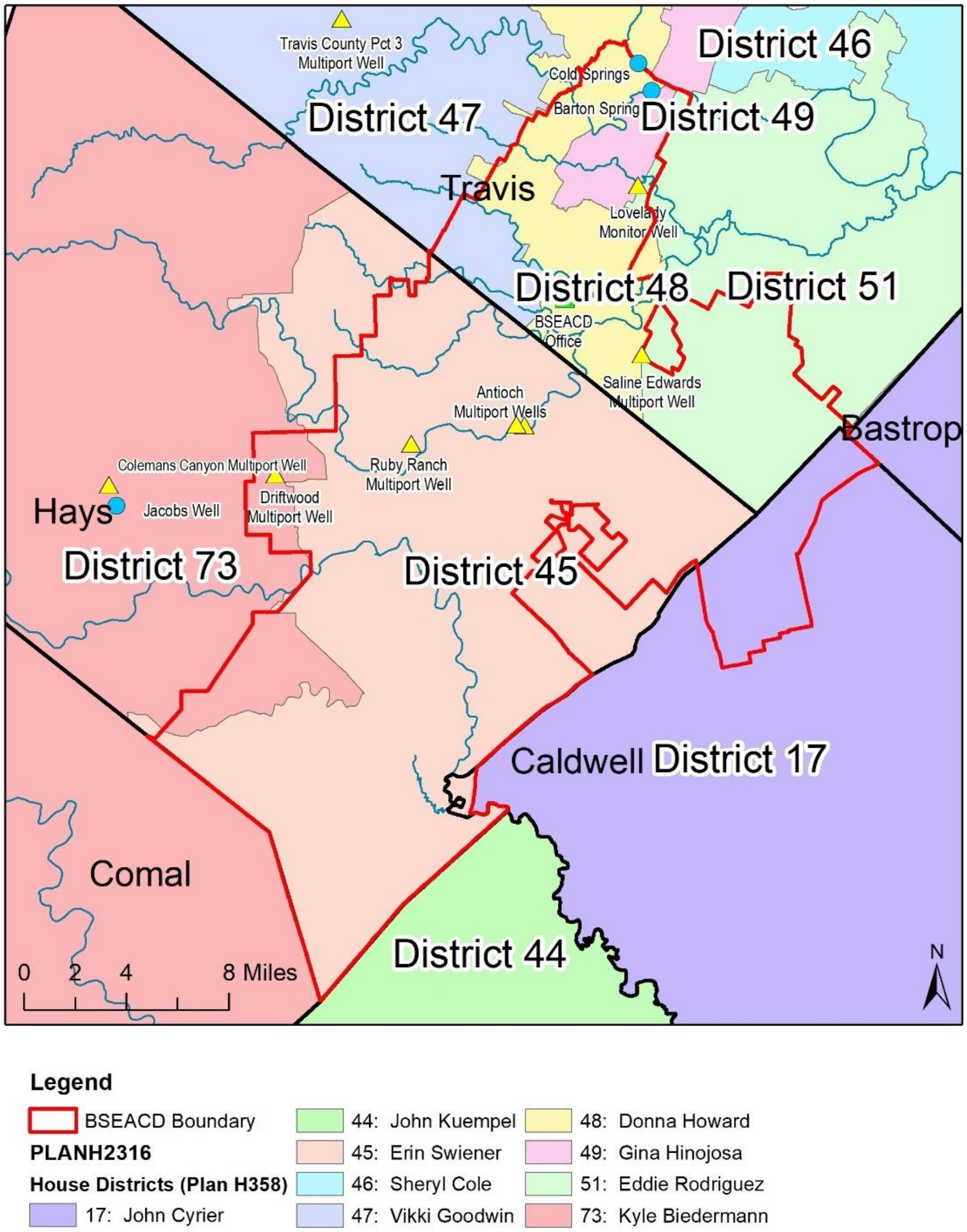


FIGURE 1-7. HOUSE DISTRICTS WITHIN THE DISTRICT'S BOUNDARY

1.4 Mission and Core Values

Through strategic planning efforts by the Board, the District has established the following elements that serve as a backdrop and guide for planning and performance:

Mission

"As the responsible authority, the Barton Springs/Edwards Aquifer Conservation District is committed to conserving, protecting, enhancing recharge, and preventing waste of groundwater and to preserving all aquifers within the District."

Vision

"The Barton Springs/Edwards Aquifer Conservation District will excel in its operations and administration so that it is considered the model and standard for other groundwater districts."

Overarching Strategic Purpose

"We will manage the District aquifers to optimize the sustainable uses of groundwater in satisfying community interests."

The Board has also established the following tenets as the core values of the District that guide all of our internal and external interactions and operations:

- We operate on the basis of the highest integrity.
- We are committed to protection of the aquifers and to prudent stewardship of the groundwater resources of the District.
- We provide exceptional service that is consistently and equitably applied and is responsive to the needs of the public, interest groups, and other governmental agencies.
- We recognize that we are a public trust and operate on a sound legal basis and under a financially responsible philosophy.
- We encourage our employees to succeed by doing what they do best, both individually and as a team, in a supportive working environment.
- We value and work to ensure transparency of our operations and openness in our dealings with various stakeholder groups.
- We strive to communicate useful information on groundwater management when and where needed by the public.

These values have been translated into the following operational guidelines for all District staff:

- **Integrity** - We maintain and exhibit the highest integrity in all of our dealings, both internally and externally.
- **Quality** - We offer high-quality services that meet or exceed our Board's expectations in providing support to their decision-making.

- **Continuous Improvement** - We continuously look for innovative approaches and processes that improve the services we provide.
- **Teamwork** - We build trust in our fellow workers and their roles, cultivate a harmonious and productive relationship among co-workers, and utilize the diversity of knowledge andperspective that reside in all of us to develop workable responses as shared solutions.
- **Problem-solving** - We solve problems at the most immediate level first, while ensuring that problems are pursued to solution and that unresolved issues are elevated to successively higher levels.
- **Decision-making** - In all decisions, we consider impacts on protection of the aquifer, on all users and other stewards of its resources, on District employees and Board members, and on other public and private entities.
- **Working Environment -** We promote a safe, healthy work environment and foster a sense of care about our fellow workers' physical, mental, and emotional well-being.
- **Staff Development** - We take advantage of those opportunities in which employees can grow professionally and/or personally, while allowing the District to apply new knowledge, skills, and expertise in accomplishing its mission.
- **Relationship-building -** We build and maintain effective, bilateral relationships and communication with the regulated community, the scientific community, the public at-large and its special interest groups, and other state, federal, and local regulators.
- **Community Outreach** - We communicate regularly and effectively with stakeholders and the public, to educate and disseminate information about groundwater use, conservation, protection, and resource value.
- **Value Proposition** - As individual staff members, we provide the District with an honest day's work each working day and receive in return a competitive, fair compensation and benefits package and valued, challenging work assignments.

Through its continuing strategic and management planning process, the District Board has established the following as overall Critical Success Factors **(**CSFs**)** for the District that underpin the District's management objectives in this Plan:

- **Scientific CSF -** Providing sound science to support policy and tactical decisions made by the District that affect water supply users and endangered species habitat;
- **Business Administrative CSF -** Being highly efficient, accurate, and fair in administering transactional activities related to all District programs;
- **Regulatory CSF -** Developing and instituting an equitable and consistently administered regulatory program that is required to serve our mission;
- **Political CSF -** Being a respected, effective part of the state and local political landscape for water resource management and its stakeholder communities;
- **Educational CSF -** Serving our permittees, stakeholders, and the public at large as a readily accessible 'source of first resort' for reliable information about local water, groundwater, aquifer science, water use and conservation; and
- **Sustaining CSF -** Providing the programmatic and resource basis for innovative, cost-effective solutions to maintain and augment the sustainable quantity of water in the District and to protect the quality of District waters required for various existing uses.

1.5 Management of Groundwater Resources in the District

Background. Since 1904, the legal framework applied to groundwater resources in Texas has been the common law "Rule of Capture." Although the Rule of Capture remains in effect today, GCDs such as the District have been established across the state and authorized to modify how the Rule of Capture is to be applied within their boundaries, as part of a comprehensive, approved groundwater management plan.

In 1997, the Texas Legislature codified the commitment to GCDs in Chapter 36, Section 36.0015 of the TWC by designating GCDs as the preferred method of groundwater management. This section of Chapter 36 also establishes that GCDs will manage groundwater resources in order to protect property rights, balance the conservation and development of groundwater to meet the needs of this state, and use the best available science through rules developed, adopted, and promulgated in accordance with the Chapter. As the overarching statute governing GCDs, Chapter 36 gives specific directives to GCDs and the statutory authority to carry out such directives. It provides the so-called "tool box" that enables GCDs to promulgate the appropriate rules needed to protect and manage the groundwater resources within their boundaries given consideration to the conditions and factors unique to each GCD.

In addition to Chapter 36 authority, the District has the powers expressly granted by Chapter 8802 of the Special District Local Laws Code ("the District Enabling Legislation"). Applied together, these statutes provide the District with the authority to serve the statutory purpose to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions. This section provides an overview of the District's application of the authority provided to manage the groundwater resources within the District and the fundamental management concepts and strategies that embody the District's regulatory and permitting program.

Evolution of the District's Regulatory Program.

Since its creation in 1987, the District has applied the statutory authority and sound science to manage its groundwater resources. The District established a precedent for developing the governing polices and rules through an initial data-driven evaluation of the science to characterize the District's aquifers followed by a thorough vetting by affected stakeholders and the public. This process has served to inform the Board's direction and policy decisions resulting in the current regulatory program that has evolved to address challenges unique to the District. This evolution has been marked by key milestones producing management strategies that are now integrated within the current regulatory approach. A chronological summary of the milestones and associated management strategies is provided as follows.

<u>Key Milestones in Regulatory Program</u>
1987-2004: Historical Production Permits2004: Sustainable Yield Study
2004: Conditional Production Permits
2007: Extreme Drought Withdrawal Limitation (EDWL)
2009: Ecological Flow Reserve
2009: Management Zones
2010: DFC Determination
2015: HB 3405
2016: Unreasonable Impacts
2018/2019: Final Habitat Conservation Plan and Incidental Take Permit

Historical Production Permits (1987-2004). After creation of the District in 1987, the initial focus was on issuing permits that addressed historical and existing nonexempt use from the freshwater Edwards Aquifer and collecting data on aquifer conditions. The production permits issued allowed existing well owners, primarily utilities providing public water supply, with existing investments in wells and infrastructure, to continue groundwater production to support their existing uses and water demands. The establishment of a monitor well network provided data on aquifer conditions that would later prove to be integral to establishing policies and rules to accomplish the groundwater management objectives for the Edwards Aquifer. Withdrawals from existing wells that were nonexempt and registered with the District as of September 9, 2004, were designated with Historical-use Status and authorized under permits designated as Historical Production Permits. These permits authorize firm-yield production from the freshwater Edwards Aquifer even during extreme drought conditions.

Sustainable Yield Study (2004). In 2004, the District completed the sustainable yield study to evaluate potential impacts to groundwater availability and spring flows from various rates of groundwater pumping during 1950s drought-of-record (DOR) conditions. To guide the study, the Board defined sustainable yield as:

> *The amount of water that can be pumped for beneficial use from the aquifer under drought-of-record conditions after considering adequate water levels in water-supply wells and degradation of water quality that could result from low water levels and low spring discharge.*

The study concluded that the District had already reached the sustainable yield limits for the Edwards Aquifer with findings indicating that without curtailments in the then-current rate of permitted pumping (~10 cfs), during the recurrence of DOR conditions, Barton Springs would cease to flow and as many as 19% of all Edwards Aquifer wells in the District would be negatively impacted (Hunt and Smith, 2004). These findings effectively unified two core management objectives to avoid unreasonable impacts: 1) preservation of spring flows as habitat for endangered species, and 2) preservation of aquifer levels and groundwater supplies for existing users, by confirming that both objectives would be compromised without active management during extreme drought conditions.

Conditional Permits (2004). In response to the findings of the sustainable yield study, the District modified its Rules effective on September 9, 2004, to limit firm-yield groundwater production from the freshwater Edwards Aquifer. This date marks the endpoint for issuance of firm-yield Historical Production Permits and the beginning of interruptible Conditional Production Permits requiring up to complete cessation of pumping during extreme drought. This Board-adopted policy served to respond to the findings of the sustainable yield study that indicated the limited amount of firm-yield availability during extreme drought, while also allowing for increased or additional groundwater production during no-drought conditions.

Extreme Drought Withdrawal Limitation (2007) and Ecological Flow Reserve (2009). The District experienced a severe drought in 2006 that reinforced the need to further refine the regulatory program to manage the district aquifers pursuant to the sustainable yield polices adopted in 2004. In response, the District initiated a stakeholder driven effort to solicit input and conducted two rounds of rulemaking (January and April, 2007) to adopt rules that would further develop the drought management rules, the conditional permitting program, and establish the Extreme Drought Withdrawal Limitation (EDWL) as a cap on firm-yield groundwater production from the freshwater Edwards Aquifer. The EDWL was set at

8.5 cfs to represent the total amount of aggregate authorized (after curtailments) and exempt groundwater production at that point in time and the maximum amount ever to be authorized going forward. The EDWL was the predecessor to the DFCs adopted in the joint-regional planning process in 2010 and served as the turning point in which the District would commit to further decrease aggregate extreme drought groundwater production.

In 2009, the EDWL was bolstered with the establishment of the Conservation Permit and the Ecological Flow Reserve. The Conservation Permit is a protected, accumulative permit held only by the District to serve as a holding vehicle for all firm-yield permitted production that was previously authorized and since retired and is now permanently dedicated in the Ecological Flow Reserve. Retired permitted production dedicated to the Ecological Flow Reserve may not be re-permitted for firm-yield production during extreme drought and is an integral component of the District's Habitat Conservation Plan (HCP; see section 4.1, page 59 for more about the HCP). To date, 82,305,124 gallons or 0.35 cfs has been retired and placed in the Ecological Flow Reserve.

Management Zones (2009). With implementation of Conditional Permitting in 2004 and the establishment of the EDWL in 2007, firm-yield availability from the freshwater Edwards Aquifer was effectively fully appropriated. This permitting cap created an impetus to recognize a distinction from the other non-freshwater Edwards aquifers in the District that had additional availability that could continue to be permitted on a firm-yield basis, even during extreme drought. The District recognized the benefit of creating Management Zones that allow for separate permitting and production rules unique to each aquifer and its subdivisions or geographic area. The initial Management Zones (MZs) were created by rule in 2009 and now include the following MZs (see Figures 1-8 and 1-9):

- Western Freshwater Edwards MZ
- Eastern Freshwater Edwards MZ
- Saline Edwards MZ
- Upper Trinity MZ
- Middle Trinity MZ
- Lower Trinity MZ
- Austin Chalk MZ (minor)
- Alluvial MZ (minor)

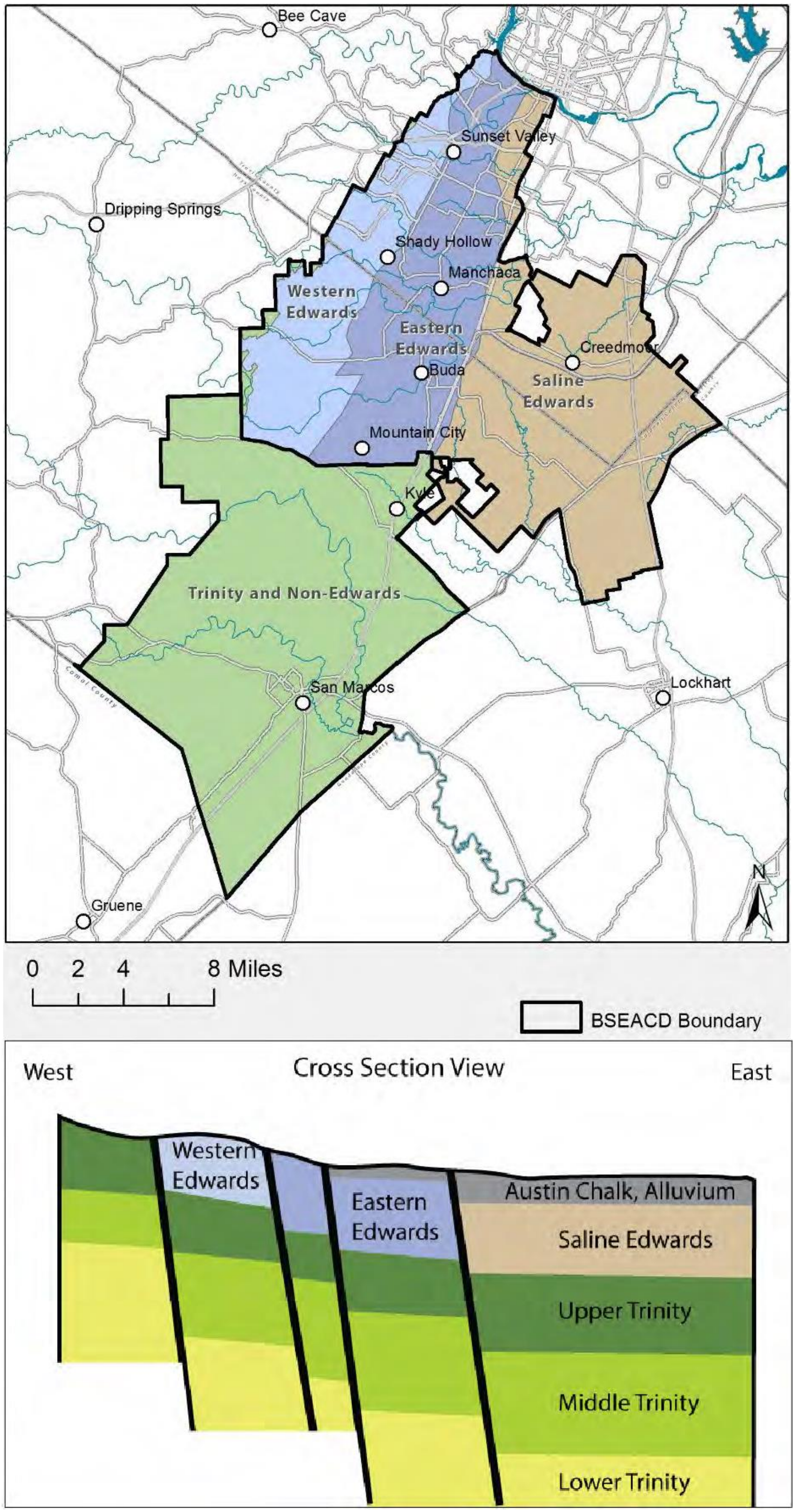


FIGURE 1-8. MANAGEMENT ZONES – MAP VIEW AND CROSS-SECTION

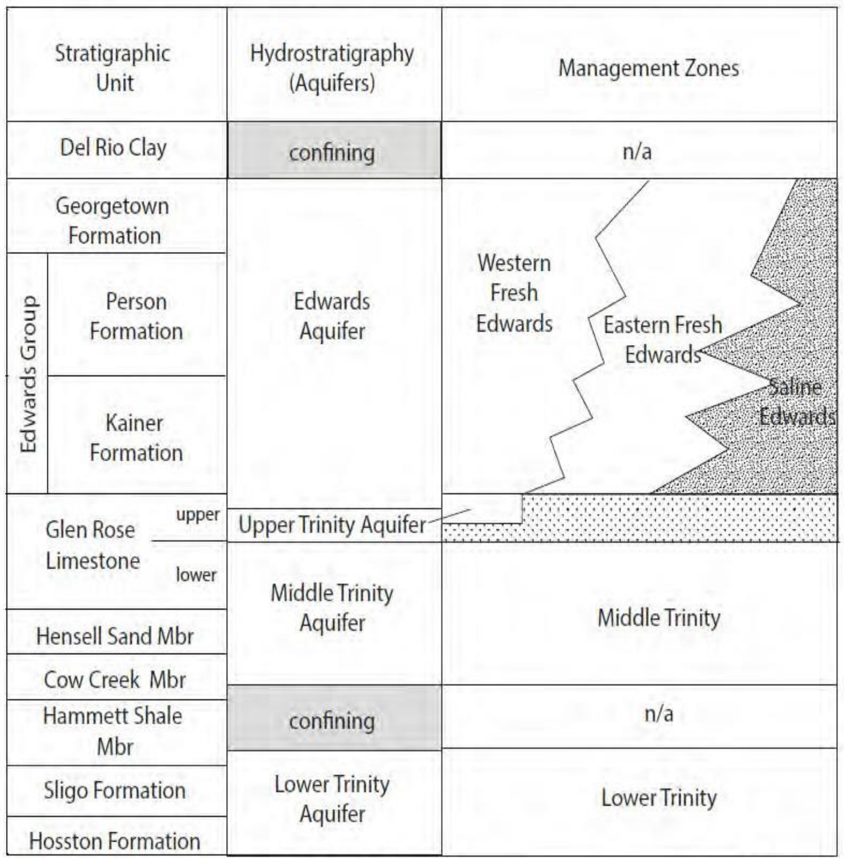


FIGURE 1-9. CORRELATION CHART SHOWING STRATIGRAPHIC UNITS, AQUIFERS, AND MAJOR MANAGEMENT ZONES (modified from Barker and Ardis 1996)

Desired Future Conditions and Modeled Available Groundwater (2010). The evolution of the District's permitting and drought management program described above set the stage for setting aquifer-based management goals known as Desired Future Conditions (DFCs) through the joint-regional groundwater planning process put in place with the passage of HB 1763 in 2005 (see Section 1.1, Purpose of the District Management Plan). The DFCs are established by the GCDs within GMAs to collectively determine the quantifiable aquifer condition that will be maintained over a 50-year planning period and to encourage coordinated management of shared aquifers. The maximum amount of groundwater production allowed to preserve that DFC is known as the Modeled Available Groundwater (MAG) estimate and is determined by the TWDB and provided to the GCDs to be considered as a factor in permitting decisions (see Section 2.2, Modeled Available Groundwater based on DFC). The District has territory within and participates in joint planning in GMA 10 (see Figure 1-3).

As part of the DFC decision-making in the first-round groundwater planning that culminated in 2010, the Board considered studies concerning dissolved oxygen (DO) concentrations and salamander mortality conducted in support of the District's HCP (see below, "Habitat Conservation Plan"), which suggested that Barton Springs flow needed to be higher during extreme drought than what could be achieved under the then-current permitting and drought management program and the established EDWL. This result informed the District's recommendation to GMA 10 for the northern segment of the GMA (primarily the

District's territory) to adopt an extreme drought DFC for the freshwater Edwards Aquifer to preserve a minimum spring flow rate at Barton Springs of 6.5 cfs during a recurrence of DOR conditions. The corresponding MAG allowing only 5.2 cfs of total aggregate annual pumping was substantially lower than the EDWL of 8.5 cfs established in 2007 and the aggregate production (after curtailments) of the then-current regulatory program (2010) of 6.7 cfs.

The DFCs sets an ambitious goal for maintaining minimum spring flows and water well supplies during DOR. The DFCs, coupled with preparation of the District's HCP beginning in 2004, prompted an expanded focus on conservation and demand management, including exploring the feasibility of alternative water supplies that could be used to substitute for production under Edwards Aquifer historical production permits. In 2012, the District initiated a stakeholder driven effort to develop a plan and implement measures to close the 1.5 cfs gap through adoption of more aggressive drought rules, and encouraging the permanent retirement of historical Edwards Aquifer permits to be dedicated to the Ecological Flow Reserve discussed above.

DFCs in GMAs 9 and 10 were also adopted for the other aquifers including the saline Edwards Aquifer (GMA 10) and the Trinity Aquifer (GMAs 9 and 10) reflecting the District's expanded focus and elevated priority to manage all of the aquifers in the District (see Section 2.2, Modeled Available Groundwater based on DFC).

Habitat Conservation Plan (2004-2018/2019). The sustainable yield study in 2004 also indicated that groundwater withdrawals from the freshwater Edwards Aquifer in the District would be accompanied by a rapid, one-for-one volumetric reduction in springflows at Barton Springs during a DOR recurrence. The impact of such reduced springflow on the endangered species of salamanders that use Barton Springs as their sole habitat was then unknown. Although the legal obligations were uncertain, the District opted to commit to managing the Edwards Aquifer groundwater production to avoid or minimize its impact on the endangered species to the greatest extent practicable and on an enduring basis. (Similar conclusions were being drawn at the same time by the federal courts and ultimately the Texas Legislature for the southern segment of the Edwards Aquifer and its own suite of endangered species.) To accomplish this goal, there was a need for a better understanding of the consequences of regulatory program options on the endangered species at Barton Springs.

Consequently, the District began the process of developing an HCP under the federal Endangered Species Act, in anticipation of applying for an Incidental Take Permit from the U.S. Fish & Wildlife Service (USFWS). As part of the HCP development process, the District initiated several biological and hydrogeological science-based studies to determine how such protection of the salamanders could be most effectively achieved while protecting the rights of groundwater owners. These studies received substantial funding from federal matching grants, administered by the Texas Parks and Wildlife Department, as well as substantial financial and in-kind participation by the District. The supporting studies included: a) a first-of-its-kind laboratory and ecological modeling study of the effects of reduced DO concentrations and increased salinity on the Barton Springs salamander, conducted by the University of Texas Department of Integrated Biology (Poteet and Woods, 2007; Woods et al., 2010); b) development of a more rigorous and meaningful drought trigger methodology to support a new, more stringent drought management program that featured the imposition of a junior-senior permitting scheme ("Conditional Permits" described above); and c) a preliminary integrated HCP and Environmental Impact Statement (EIS) document.

A series of changes in both federal and state laws and regulations, changes in federal personnel providing guidance and oversight, and changes in the drought management program in response to severe droughts in 2006, 2008-2009, and 2011 lengthened the timeline for completing the HCP. But over the decade during which the HCP was developed, the HCP conservation measures that avoided, minimized, and mitigated effects and impacts of groundwater production on the endangered species ultimately became integrally intertwined with the District's groundwater management scheme and its regulatory program. Currently, the goals, objectives, strategies, and performance standards in this Plan (see Section 3.3, Goals and Strategies) are aligned in all material respects with the goals and conservation measures in the final HCP, and therefore link the HCP program with the District's authorized regulatory, science, educational, and other programs during the term of this Plan. In 2018, the USFWS approved the District's HCP and issued a 20-year Incidental Take Permit (ITP). The HCP became fully executed (i.e., with all necessary signatures) in 2019. The District is required to submit a HCP annual report to USFWS each year.

HB 3405 – Unreasonable Impacts (2015 - 2016). In 2015, HB 3405 was passed by the Legislature to extend the jurisdiction of the District, providing authority over all non-Edwards aquifers in the annexed area of the "Shared Territory" within Hays County, and to affirm District authority over all aquifers in the "Exclusive Territory" which described the jurisdictional area of the District prior to annexation (seeFigure 1-2). HB 3405 also codified a temporary permitting process to allow existing nonexempt well owners to transition into a regular permit. The initial "Temporary Production Permits" were to be issued to existing nonexempt well owners for production not to exceed the "maximum production capacity" and converted to regular permits for the same amount contingent on an evaluation and determination of whether that amount would cause either 1) a failure to achieve the applicable adopted DFCs for the aquifer, or 2) an unreasonable impact on existing wells. These factors triggered two rounds of rulemaking in July 2015 and April 2016 to implement the provisions of HB 3405 to first, establish the procedure for processing Temporary Production Permits and second, further define the second factor involving the evaluation of unreasonable impacts.

The second round of rulemaking would incorporate the concept of avoidance of unreasonable impacts into an updated sustainable yield definition and expand the evaluation of unreasonable impacts from beyond HB 3405 permits to be applied as a principal consideration in all future permit decisions. Such an evaluation is authorized under provisions of Chapter 36. Specifically, Water Code § 36.002(d)(2) allows the District to regulate production under §§ 36.113, 36.116, or 36.122. Section 36.113(d)(2) requires the District to consider whether the proposed use of water "unreasonably affects" existing groundwater and surface water resources or existing permit holders. Section 36.113(f) provides permits may be subject to terms and conditions necessary to "lessen interference." Section 36.116 authorizes the District to regulate production of groundwater by setting production limits on wells to "prevent interference" between wells. Finally, the District's general rulemaking authority under § 36.101 again express authority to address interference and impacts.

This consideration of the potential for unreasonable impacts can be based on the analysis of site-specific aquifer testing using numerical models and the best available analytical tools and avoidance measures as permit conditions if the evaluation of the proposed production amount confirms potential for such impacts. The concept of avoiding unreasonable impacts also provides a basis for the sustainable yield definition and could be used in the assessment of sustainable yield moving forward. The following statement was adopted by the Board to memorialize this key management strategy as policy:

"The District seeks to manage total groundwater production on a long-term basis while avoiding the occurrence of unreasonable impacts. The preferred approach to achieve this objective is through an evaluation of the potential for unreasonable impacts using the best available science to anticipate such impacts, monitoring and data collection to measure the actual impacts on the aquifer(s) over time once pumping commences, and prescribed response measures to be triggered by defined aquifer conditions and implemented to avoid unreasonable impacts. Mitigation, if agreed to by the applicant, shall be reserved and implemented only after all reasonable preemptive avoidance measures have been exhausted, and shall serve as a contingency for the occurrence of unreasonable impacts that are unanticipated and unavoidable through reasonable measures."

The policy statement affirms the District's preferred approach to consideration of localized impacts in permitting decisions and establishes the preference for avoidance of such impacts reserving any mitigation only for unavoidable or unanticipated impacts. The Board further implemented this approach by adopting rules defining the term "unreasonable impacts" as follows:

"Unreasonable Impacts" – a significant drawdown of the water table or reduction of artesian pressure as a result of pumping from a well or well field, which contributes to, causes, or will cause:

1. well interference related to one or more water wells ceasing to yield water at the ground surface;
2. well interference related to a significant decrease in well yields that results in one or more water wells being unable to obtain either an authorized, historic, or usable volume or rate from a reasonably efficient water well;
3. well interference related to the lowering of water levels below an economically feasible pumping lift or reasonable pump intake level;
4. the degradation of groundwater quality such that the water is unusable or requires the installation of a treatment system;
5. the Desired Future Condition (DFC) to not be achieved;
6. depletion of groundwater supply over a long-term basis, including but not limited to chronic reductions in storage or overdraft of an aquifer;
7. a significant decrease in springflow or baseflows to surface streams including a decrease that may cause an established minimum springflow or environmental flow rate to not be achieved; or
8. land subsidence.

Expansion of the District's territory and confirmation of authority of the Trinity Aquifer and other aquifers in both the previous area and the new Shared Territory would also effectively shift the District's prior emphasis on the Edwards Aquifer as the primary management focus to also include the Trinity Aquifer and other aquifers as aquifers of equal priority.

Synopsis of District's Current Regulatory Approach.

Since its creation in 1987, the District has honored the established precedent of developing policy and management strategies on the basis of statutory compliance, sound science, and stakeholder input. The evolution of the District's policies and strategies chronicled above has produced a regulatory program that is fair, innovative, and customized to objectively address the challenges and management objectives unique to the District. The District's management approach evolved from an initial focus on permitting for historical use from 1987 until the completion of the sustainable yield study in 2004. On the basis of that study, the District began preparation for management under an HCP to protect the endangered salamanders at Barton Springs. To this end, the District implemented rules and policies to:

- cap firm-yield production from the freshwater Edwards Aquifer;
- allow future production from the freshwater Edwards Aquifer only on an interruptible basis through Conditional Production Permits;
- create an Ecological Flow Reserve under the District-held Conservation Permit to support minimum spring flow rates during Extreme Drought;
- create and promulgate rules for MZs to allow production from other aquifers to serve as alternative supplies to the freshwater Edwards Aquifer;
- invest in exploring the feasibility of alternative water supply strategies (e.g. aquifer storage and recovery, brackish groundwater desalination);
- adopt ambitious DFCs to preserve minimum spring flows through the joint-regional groundwater planning process; and
- implement an aggressive drought management program to preserve minimum spring flow rates and groundwater supplies.

After the passage of HB 3405 in 2015, the District's attention then broadened to include the management of the Trinity Aquifer and other non-Edwards aquifers in the Shared Territory, the development of a permitting program with a refined interest in managing to avoid unreasonable impacts, and an updated definition of sustainable yield. Sustainable yield is now defined as:

The amount of groundwater available for beneficial uses from an aquifer under a recurrence of drought of record conditions, or worse, without causing unreasonable impacts.

The integration of these strategies collectively produced a program formed on the basis of demand- based permitting coupled with an evaluation of the potential for localized and regional unreasonable impacts. This permitting approach is bolstered by an active drought management program to abate groundwater depletion during District-declared drought. The current permitting and drought management programs are further described below.

Permitting. The current permitting program in place and supported by this Plan applies a three-part evaluation to: a) affirm beneficial use in accordance with demand-based permitting standards, and b) evaluate the full range of potential impacts for each production permit request. The three-part permit evaluation involves (see Figure 1-10):

1) **Reasonable Nonspeculative Demand.** District rules require that all production permit applications indicate the proposed use type of the well and the intended use and the volume of

annual production. The requested volume and use are evaluated to affirm that it is for beneficial use and for an annual volume that is nonspeculative and commensurate with reasonable demand to avoid over-permitting and discourage waste. The evaluation involves calculation of annual demand based on accepted standards, planning estimates, and regional trends and assurances that there are actual plans and intent to use the water for beneficial purposes within the near term.

2) **Local-scale Evaluations**. Production permit applications for large-scale groundwater production are also evaluated to assess the potential for localized impacts attributed to the proposed demand-based production volume. The District evaluation is performed on the basis of the results of aquifer testing and a hydrogeological report conducted in accordance with District's guidelines and submitted to support the application. Staff evaluates the results of the test and the report through application of the best available science to predict drawdowns (analytical or numerical models) and the potential for unreasonable impacts to existing wells.

3) **Aquifer-scale Evaluations.** Finally, each production permit application is evaluated to assess the potential for impacts to the applicable DFCs and other more long-term conditions defined as unreasonable impacts. This involves a broader evaluation of the cumulative impacts of the aggregate pumping on a regional scale and beyond the term of a permit. Such evaluations require more complex tools, modeling, and ongoing aquifer monitoring and data collection to assess actual and predicted impacts to the DFC and other indicators. The MAG is also a factor considered in this evaluation.

The extent of the evaluation scales with the magnitude of the requested production volume, with the more comprehensive evaluations reserved for the more complex, larger-scale projects with greater potential to cause unreasonable impacts. Each component of the evaluation is considered individually and collectively to determine the General Manager's action or recommendation to the Board to either:

1) deny the permit, 2) approve the permit, or 3) approve with special conditions if necessary to avoid unreasonable impacts.

FIGURE 1-10. THREE-PART PERMIT EVALUATIONS

Drought Management. One of the principal responsibilities central to the District's mission is to manage groundwater production during drought conditions when the aquifers are most stressed. After District creation in 1987 and until 2004, the District put into place its initial permitting program and drought management program with a network of drought indicator wells and curtailments linked to percentiles of monthly flow at Barton Springs. With a burgeoning regional population and increasing demand on the District's aquifers coupled with the findings of the sustained yield study, the District recognized a need to improve the drought management program. Significant droughts in 2006, 2008–09, and 2011 provided further impetus for a series of amendments that implemented a more effective science-based drought trigger methodology, and expanded permit-based drought rules and enforcement protocol. The amendments produced milestones in the District's regulatory approach (e.g., conditional permitting,the EDWL, the Ecological Flow Reserve, MZs, as described above) that were the product of numerous scientific studies conducted by the District's hydrogeologists, vetted through technical consultants and advisors, reviewed and commented on by stakeholders and the public, and approved by the Board.

The current drought management program in place and supported by this Plan is implemented through User Drought Contingency Plans (UDCPs) that are an integral component required of each Production Permit. Drought declarations involve continuous evaluation of the aquifer conditions measured at the drought indicators for the Edwards Aquifer that also serve as surrogates indicative of regional drought conditions for all District aquifers. When the designated aquifer conditions are met, permittees are required to implement the prescribed measures of the UDCPs requiring mandatory curtailments of permitted groundwater production based on permit type and aquifer management zones.

Curtailments are implemented on a monthly basis during District-declared drought and increase with drought severity with maximum curtailments reserved for an Emergency Response Period (see Table 1-1). The curtailments are derived based on a pumping profile representing the average monthly distribution of the demand-based annual permit volume for each groundwater-use type and are calculated as a percentage reduction off of the monthly baseline amount. Authorized permit volumes based on reasonable nonspeculative demand, monthly reporting of actual groundwater production by permittees, and active enforcement of monthly curtailments are integral to effective drought management to ensure the more immediate and consistent relief in actual pumping pressure needed to sustain spring flows and existing water supplies during District-declared drought until the drought conditions recede and the aquifers recover. The reader is encouraged to visit the TWDB's Drought Dashboard: https://www.waterdatafortexas.org/drought .

Summary and Future Policy Considerations. Collectively, this Plan and the supporting rules and policies are protective of historical use based on when production exceeds scientifically defined sustainable yield and serve the District's intended purpose pursuant to TWC §36.015. All strategies are integrated and integral to achieving the DFCs in compliance with state law and the measures of the District's HCP in compliance with the prospective Incidental Take Permit (ITP) and with federal law.

As demonstrated above, the regulatory program must be adaptable and able to evolve as the science of the aquifers evolve and, inevitably, as the laws governing GCDs change. As such, the current regulatory program as supported by this Plan may also require updates and changes in the interim prior to subsequent plan updates. Therefore, the current policies and rules shall not be considered static and shall evolve as necessary, provided that such changes are not fundamentally inconsistent with the goals and objectives of this Plan and/or the HCP.

Table 1-1: Mandatory Drought Curtailments.

Curtailments established for different well permit types, aquifers, and drought conditions. (Curtailment expressed as percentage of authorized monthly groundwater production in designated drought stage. For example, freshwater Edwards Aquifer historical permittees would be required to curtail their authorized monthly withdrawal by 30% during Stage III Critical Drought.)

Drought Curtailment Chart

Aquifer	Edwards Aquifer						Trinity Aquifer			
Management Zone	Eastern/Western Freshwater					Saline	Lower	Middle	Upper	Outcrop
Permit Type	Historical	Conditional				Hist.	Hist.	Hist.	Hist.	Hist.
		Class A	Class B	Class C	Class D					
Drought Stages										
No Drought	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Water Conservation (Voluntary)	10%	10%	10%	10%	10%	0%	10%	10%	10%	10%
Stage II Alarm	20%	20%	50%	100%	100%	0%	20%	20%	20%	20%
Stage III Critical	30%	30%	75%	100%	100%	0%	30%	30%	30%	30%
Stage IV Exceptional	40%	50%[1]	100%	100%	100%	0%	30%	30%	30%	30%
Emergency Response Period	50%[3]	>50%[2]	100%	100%	100%	0%	30%	30%	30%	30%

Percentages indicate the curtailed volumes required during specific stages of drought.

1 Only applicable to LPPs and existing unpermitted nonexempt wells after A to B reclassification triggered by Exceptional Stage declaration.

2 Curtailment > 50% subject to Board discretion.

3 ERP (50%) curtailments become effective October 11, 2015. ERP curtailments to be measured as rolling 90-day average after first three months of declared ERP.

1.6 TWDB Checklist Reference Table

Texas Water Development Board

Groundwater Conservation District Management Plan Checklist, effective December 6, 2012

District name: ☐ **Official review** ☐ **Prereview**

Reviewing staff: **Date plan received:** **Date plan reviewed:**

A management plan shall contain, unless explained as not applicable, the following elements, 31 TAC §356.52(a):

	Citation of rule	Citation of statute	Present in plan and administratively complete	Source of data	Evidence that best available data was used	Notes
Is a paper hard copy of the plan available?	31 TAC §356.53(a)(1)					
Is an electronic copy of the plan available?	31 TAC §356.53(a)(2)					
1. Is an estimate of the modeled available groundwater in the District based on the desired future condition established under Section 36.108 included?	31 TAC §356.52(a)(5)(A)	TWC §36.1071(e)(3)(A)				p.
2. Is an estimate of the amount of groundwater being used within the District on an annual basis for at least the most recent five years included?	31 TAC §356.52(a)(5)(B); §356.10(2)	TWC §36.1071(e)(3)(B)				p.
For sections 3-5 below, each district must use the groundwater availability modeling information provided by the TWDB in conjunction with available site-specific information provided by the district when developing the required estimates, 31 TAC §356.52(c):						
3. Is an estimate of the annual amount of recharge, from precipitation, if any, to the groundwater resources within the District included?	31 TAC §356.52(a)(5)(C)	TWC §36.1071(e)(3)(C)				p.
4. For each aquifer in the district, is an estimate of the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams and rivers, included?	31 TAC §356.52(a)(5)(D)	TWC §36.1071(e)(3)(D)				p.
5. Is an estimate of the annual volume of flow	31 TAC §356.52(a)(5)(E)	TWC §36.1071(e)(3)(E)				
a) into the District within each aquifer,						p.
b) out of the District within each aquifer,						p.
c) and between aquifers in the District,						p.
if a groundwater availability model is available, included?						
6. Is an estimate of the projected surface water supply within the District according to the most recently adopted state water plan included?	31 TAC §356.52(a)(5)(F)	TWC §36.1071(e)(3)(F)				p.
7. Is an estimate of the projected total demand for water within the District according to the most recently adopted state water plan included?	31 TAC §356.52(a)(5)(G)	TWC §36.1071(e)(3)(G)				p.
8. Did the District consider and include the water supply needs from the adopted state water plan?		TWC §36.1071(e)(4)				p.
9. Did the District consider and include the water management strategies from the adopted state water plan?		TWC §36.1071(e)(4)				p.
10. Did the district include details of how it will manage groundwater supplies in the district	31 TAC §356.52(a)(4)					p.
11. Are the actions, procedures, performance, and avoidance necessary to effectuate the management plan, including specifications and proposed rules, all specified in as much detail as possible, included in the plan?		TWC §36.1071(e)(2)				p.
12. Was evidence that the plan was adopted, after notice and hearing, included? Evidence includes the posted agenda, meeting minutes, and copies of the notice printed in the newspaper(s) and/or copies of certified receipts from the county courthouse(s).	31 TAC §356.53(a)(3)	TWC §36.1071(a)				p.
13. Was evidence that, following notice and hearing, the District coordinated in the development of its management plan with regional surface water management entities?	31 TAC §356.51	TWC §36.1071(a)				p.
14. Has any available site-specific information been provided by the district to the executive administrator for review and comment before being used in the management plan when developing the estimates required in subsections 31 TAC §356.52(a)(5)(C), (D), and (E) ?	31 TAC §356.52(c)	TWC §36.1071(h)				p.

Mark an affirmative response with YES
Mark a negative response with NO
Mark a non-applicable checklist item with N/A

Management goals required to be addressed unless declared not applicable	**Management goal** (time-based and quantifiable) 31 TAC §356.51	**Methodology for tracking progress** 31TAC §356.52(a)(4)	**Management objective(s)** (specific and time-based statements of future outcomes) 31 TAC §356.52 (a)(2)	**Performance standard(s)** (measures used to evaluate the effectiveness of district activities) 31 TAC §356.52 (a)(3)	**Notes**
Providing the most efficient use of groundwater 31 TAC 356.52(a)(1)(A); TWC §36.1071(a)(1)	15)	16)	17)	18)	p.
Controlling and preventing waste of groundwater 31 TAC 356.52(a)(1)(B); TWC §36.1071(a)(2)	19)	20)	21)	22)	p.
Controlling and preventing subsidence 31 TAC 356.52(a)(1)(C); TWC §36.1071(a)(3)	23)	24)	25)	26)	p.
Addressing conjunctive surface water management issues 31 TAC 356.52(a)(1)(D); TWC §36.1071(a)(4)	27)	28)	29)	30)	p.
Addressing natural resource issues that impact the use and availability of groundwater and which are impacted by the use of groundwater 31 TAC 356.52(a)(1)(E); TWC §36.1071(a)(5)	31)	32)	33)	34)	p.
Addressing drought conditions 31 TAC 356.52(a)(1)(F); TWC §36.1071(a)(6)	35)	36)	37)	38)	p.
Addressing	39)	40)	41)	42)	
a) conservation,	39a)	40a)	41a)	42a)	p.
b) recharge enhancement,	39b)	40b)	41b)	42b)	p.
c) rainwater harvesting,	39c)	40c)	41c)	42c)	p.
d) precipitation enhancement, and	39d)	40d)	41d)	42d)	p.
e) brush control	39e)	40e)	41e)	42e)	p.
where appropriate and cost effective 31 TAC 356.52(a)(1)(G); TWC §36.1071(a)(7)					
Addressing the desired future conditions established under TWC §36.108. 31 TAC 356.52(a)(1)(H); TWC §36.1071(a)(8)	43)	44)	45)	46)	p.
Does the plan identify the performance standards and management objectives for effecting the plan? 31 TAC §356.52(a)(2)&(3); TWC §36.1071(e)(1)			47)	48)	
Mark required elements that are present in the plan with YES Mark any required elements that are missing from the plan with NO Mark plan elements that have been indicated as not applicable to the district with N/A					

2. Planning Data and Required Information

2.1 Hydrological Estimates

Total Estimated Recoverable Storage (TERS), per TWDB

Texas Water Code (TWC), §36.108(d) states that, before voting on the proposed desired future conditions (DFCs) for a relevant aquifer within a groundwater management area (GMA), the groundwater conservation districts (GCDs) shall consider the Total Estimated Recoverable Storage (TERS) as provided by the Executive Administrator of the Texas Water Development Board (TWDB) along with other factors listed in §36.108(d). The TERS, defined in 31 Texas Administrative Code §356.10, is the estimated amount of groundwater within an aquifer that accounts for recovery scenarios that range between 25 percent and 75 percent of the porosity-adjusted aquifer volume.

Table 2-1. TERS estimates for the BSEACD within the northern subdivision of GMA 10 (Jones, Shi, and Bradley 2013; Bradley, 2016):

Aquifer	Total Storage (acre-feet)	25% of Total Storage (acre-feet)	75% of Total Storage (acre-feet)
Edwards	130,000	32,500	97,500
Trinity*	1,200,000	300,000	900,000
Saline Edwards	690,000	172, 500	517,500

**Calculation does not include increased area in Hays County since HB 3405.*

2.2 Modeled Available Groundwater Based on DFC (per TWDB)

This Plan has been prepared to include the various DFCs adopted by the Board for aquifers in the District that are in the northern subdivision of GMA 10 (see Figure 1-1), and were determined to be "relevant" for the purposes of regional planning. These DFCs were established in accordance with the provisions of TWC 36.108 related to the joint-regional groundwater planning process. The TWDB has determined the amount of modeled available groundwater (MAG) that is available from the relevant aquifers being managed by the District and that preserve the DFCs. The DFCs and associated MAG for GMA 10 are shown below in Table2-2.

Table 2-2: Summary of DFCs and MAGs

GMA	Aquifer	DFC Summary	MAG	DFC Adoption Date
GMA 10	Northern Subdivision's Fresh Edwards (Balcones Fault Zone) Aquifer	Springflow of Barton Springs during average recharge conditions shall be no less than 49.7 cfs averaged over an 84 month (7-year) period	11,527 acre-feet[1] (16 cfs)	6/26/17
GMA 10	Northern Subdivision's Fresh Edwards (Balcones Fault Zone) Aquifer	Springflow of Barton Springs during extreme drought conditions, including those as severe as a recurrence of the 1950s drought of record, shall be no less than 6.5 cfs average on a monthly basis	3,765 acre-feet[2] (5.2 cfs)	6/26/17
GMA 10	Saline Edwards Aquifer	No more than 75 feet of regional average potentiometric surface drawdown due to pumping when compared to pre-development conditions.	3,799 acre-feet[3]	6/26/17
GMA 10	Trinity Aquifer, from preliminary Explanatory Report	Average regional well drawdown not exceeding 25 feet during average recharge conditions (including exempt and non-exempt use); within Uvalde County: no (zero) regional well drawdown (TWDB, 2015).	3,854 acre-feet, Hays Co.; 341 acre-feet, Travis Co.	6/26/17

Prior to the MAG determination by the TWDB for extreme drought conditions in the freshwater Edwards, the District relied on a modeling and water balance approach described in a study of the sustainable yield of the Barton Springs Segment of the Edwards Aquifer completed in 2004, and accepted by TWDB (Smith and Hunt, 2004). The results of that study and other numerical modeling efforts support an approximate one-to-one relationship between springflow and pumping under low-flow conditions (Hunt et al., 2011). These studies have informed the determination of the drought MAG. The lowest measured daily value of springflow is 9.6 cfs during the drought of record (DOR); the lowest monthly value is 11 cfs. Withdrawals of 10 cfs would produce a springflow of 1 cfs, and so forth. Any withdrawals more than 11 cfs would further increase impacts to wells as the aquifer is de-watered, and would increase the duration of no-flow conditions at Barton Springs. These levels of withdrawals have been determined by the Board to lead to unsustainable conditions.

This Plan has been prepared to be consistent with the approved measures in the District's HCP pursuant to the Incidental Take Permit (ITP). The requirements of the HCP have been used to establish the freshwater Edwards Aquifer DFCs in the District and in turn the MAG. The District employs a groundwater

[1] Bradley and Boghici, 2018
[2] Hunt et al. 2011
[3] Bradley, 2011.

management regulatory program that is designed to limit total authorized groundwater production from the freshwater Edwards Aquifer to no more than about 5.2 cfs during a recurrence of the DOR to comply with the DFC expression, including 4.7 cfs of permitted non-exempt production by permittees. This limitation is the MAG for the freshwater Edwards Aquifer drought DFC, and is consistent with the management objectives of the HCP (see Section 1.5, Management of Groundwater Resources in the District).

The current regulatory program maximizes the amount of springflow during the worst part of a drought similar to the DOR. However, if exempt pumpage does not substantially increase, aggregate authorized pumping needs to be further reduced by approximately 0.3 cfs to equal the extreme drought MAG. This gap amount was reduced from 1.5 cfs in 2010 and ongoing efforts are on pace to eliminate the gap completely. It is important to note that the gap estimate assumes that all authorized (not actual) pumping will be produced during a recurrence of DOR conditions which is a conservative assumption that will not likely occur. The District has adopted measures to ensure that actual production will not exceed the MAG and that minimum springflow will be preserved.

Prehistoric climatic data indicate that there may be future droughts that will be worse than the 1950s' DOR. Climate change associated with increased levels of greenhouse gases in the atmosphere may cause future droughts to be more severe than droughts that have occurred during the historic period (IPCC 2007, Nielsen-Gammon, 2008). The District has already begun to review data relating to such conditions and may consider policies in the future that would address the need and options for regulatory responses to more intense droughts. Such responses could include additional curtailments of nonexempt pumpage, but that circumstance is considered highly unlikely during the term of the Plan or even the HCP.

No sustainable yield assessments for the Trinity and Edwards (saline) aquifers have been completed prior to this Plan. Initial assessments and evaluations of the Trinity and Edwards (Saline) aquifers were conducted as part of the DFC and MAG process. An assessment of the feasibility of the saline Edwards Aquifer for desalinization and for aquifer storage and recovery (ASR) was completed by Carollo in 2018 (TWDB Contract #1548321870). Revisions to the conceptual model of the Trinity Aquifer in GMA 10 were completed in 2017 and revisions to the Trinity Hill Country Groundwater Availability Model (GAM) numerical model are underway. Furthermore, the District is developing an in-house model to improve our understanding of the Trinity Aquifer in response to different recharge/pumping scenarios. As the model evolves to yield useable results, the District aims to involve stakeholders in assessing something akin to sustainable yield. As more information becomes available, revisions to the DFC expressions and new aquifer assessments are expected.

2.3 Annual Groundwater Use, by Aquifer

Groundwater use within the District is comprised primarily of pumpage and use from the freshwater Edwards Aquifers with a much smaller but increasing component of overall pumpage coming from the Trinity Aquifers. An incidental amount of groundwater is derived from the Taylor and Austin Groups and more geologically recent alluvial deposits. Given the current management scheme of conditional permitting and the drought restrictions and curtailment requirements associated with new interruptible pumpage authorizations for the freshwater Edwards Aquifer, it is likely that future groundwater production will trend more towards pumpage from the saline Edwards Aquifer and the Middle and Lower Trinity Aquifers.

The data presented below are a compilation of District monthly meter readings reported by District permittees. The following table presents the reported use data organized by major aquifer and District water-use type (Table 2-3.) These data include neither Exempt Use, which is primarily from the Edwards Aquifer and estimated to be about 105,618,730 gallons (325 AF) annually, nor Limited Production Permits (LPPs) under the District's LPP general permit, which is also primarily from the Edwards Aquifer and estimated to be about 12,641,596 gallons (39 AF) annually.

Table 2-3. Actual Pumpage from Permitted Wells (non-LPP) for Last Five Years (in gallons and acre-feet) by Major Aquifer and Water-use Type.

Fiscal Year	PWS	Commercial	Irrigation	Industrial	Total
Edwards Aquifer					
2017	1,313,047,647	13,762,918	58,730,960	138,487,847	**1,524,029,372**
	4,030	42	180	425	**4,677**
2018	1,245,032,628	14,278,724	56,360,950	139,196,556	**1,454,868,858**
	3,821	44	173	427	**4,465**
2019	1,357,176,610	12,911,356	54,294,890	126,532,663	**1,550,915,519**
	4,165	40	167	388	**4,760**
2020	1,598,877,515	14,270,720	66,482,100	142,489,159	**1,822,119,494**
	4,907	44	204	437	**5,592**
2021	1,340,649,920	13,485,243	50,815,060	151,599,896	**1,556,550,119**
	4,114	41	156	465	**4,776**
Trinity Aquifer					
2017	43,547,659	2,163,041	164,815,696	1,784,400	**212,310,796**
	134	7	506	5	**652**
2018	42,982,497	2,555,486	170,426,856	2,893,700	**218,858,539**
	132	8	523	9	**672**
2019	40,005,420	1,987,186	153,580,858	3,726,900	**199,300,364**
	123	9	471	11	**614**
2020	48,928,678	3,273,719	152,732,323	4,349,600	**209,284,320**
	150	10	469	13	**642**
2021	38,127,201	3,369,557	166,948,251	2,785,900	**211,230,909**
	117	10	512	9	**648**
Alluvial/Austin Chalk Aquifer					
2017	0	0	813,770	0	**813,770**
	0	0	2	0	**2**
2018	0	0	702,730	0	**702,730**
	0	0	2	0	**2**
2019	0	0	174,450	0	**174,450**
	0	0	1	0	**1**
2020	0	0	317,490	0	**317,490**
	0	0	1	0	**1**
2021	0	0	48,116	0	**48,116**
	0	0	0	0	**0**

2.4 Annual Recharge from Precipitation, by aquifer

Edwards Aquifer

For the Barton Springs segment of the Edwards Aquifer, the long-term mean surface recharge should approximately equal the mean natural (i.e., with no well withdrawals) spring discharge, or about 53 cubic feet per second (cfs) at Barton Springs (Slade et al., 1986). The distribution and volume of this recharge have been modeled by many scientists. The report by Scanlon et al. (2001) documents the official TWDB GAM for the Barton Springs segment. A report by TWDB, GAM Run 08-37 (June 20, 2008), included as Appendix III, summarizes the estimated amount of recharge from precipitation, the amount of spring discharge, and the amount of flow into and out of the District for steady-state conditions in 1989. In other words, GAM Run 08-37 was based on a steady-state model that used average recharge for a 20-year period – 1979 through 1998. Annual recharge from precipitation for the modeling was 42,858 acre-ft (59.2 cfs).

A more recent report by Wade (2022) featuring the results of the TWDB's GAM Run 22-006 provides information that supercedes GAM Run 08-37. While using the same basic model, the newer GAM Run results are based on transient simulations using monthly recharge and pumping data for a 10-year period – 1989 through 1998 (Scanlon et al. 2001). The current GAM Run results estimate the annual amount of recharge from precipitation to the District to be 58,712 acre-feet (81.04 cfs) or a 37 percent increase as compared to the previous GAM Run. The 10-year period that the latest GAM Run is based on was a wetter period on average than the 20-year period used for the earlier GAM Run and likely explains, in part at least, the increase in recharge (see Appendix III.)

The majority (as much as 85%) of recharge to the aquifer is derived from streams originating on the contributing zone, located up gradient to the west of the recharge zone. Water flowing onto the recharge zone sinks into numerous caves, sinkholes, and fractures along its six major, ephemeral streams and the perennial Blanco River. The remaining recharge (15%) occurs in the upland areas of the recharge zone (Slade et al., 1986). Site-scale measurements suggested a larger portion of recharge occurs in the uplands (Hauwert, 2009; Hauwert, 2011). Recent water balance studies indicate that stream recharge contributed 56-67% of recharge with upland, and other small sources, contributing the remaining 33-44% (Hauwert, 2016). Studies have shown that recharge is highly variable in space and time, and a large amount can be focused within discrete features (Smith et al., 2001). For example, Onion Creek is the largest contributor of recharge (32-34 %) with maximum recharge rates up to 160 cfs (Slade et al., 1986; Hauwert, 2016). Antioch Cave is located within Onion Creek and is the largest- capacity recharge feature with an average recharge of 46 cfs and a maximum of 95 cfs during one 100- day study (Fieseler, 1998). Recent work at Antioch Cave has also documented greater than 100 cfs of recharge entering the aquifer through the entrance to Antioch Cave (Smith et al., 2011). Dye tracing studies have shown that some of this water flows directly and very rapidly to Barton Springs with an unknown percentage contributing to storage.

Groundwater divides delineate the boundaries of aquifer systems and influence not only the local aquifer hydrodynamics, but also the groundwater budget (recharge). The groundwater divide separating the San Antonio and Barton Springs segments of the Edwards Aquifer has historically been drawn along topographic or surface water divides between the Blanco River and Onion Creek in the recharge zone, and along potentiometric highs in the confined zone between the cities of Kyle and Buda in Hays County. Recent studies reveal that during wet conditions, the groundwater divide is located generally along Onion Creek in the recharge zone, extending easterly along a potentiometric ridge between the cities of Kyle and Buda toward the saline zone boundary (Hunt et al. 2006). During dry conditions, the hydrologic divide moves south and is located along the Blanco River in the recharge zone, extending southeasterly to San

Marcos Springs (Johnson et al., 2011). Thus, the groundwater divide is a hydrodynamic feature dependent upon the hydrologic conditions (wet versus dry) and the resulting hydraulic heads between Onion Creek and the Blanco River. Recent studies also reveal that under extreme drought conditions, some groundwater may bypass San Marcos Springs and flow toward Barton Springs (Land et al., 2011), and the Blanco River is the only source of active surface water recharge during drought conditions (Smith et al., 2012).

Trinity Aquifer

The Trinity Aquifer, exposed in the Hill Country region (west of the District), receives recharge from rainfall on the outcrop, losing streams, and perhaps lakes during high levels (Mace et al., 2000). Mace etal. (2001) estimated recharge for the Upper and Middle Trinity Aquifers is equal to 4 to 6 percent of mean annual rainfall. Some of the Trinity units are recharged by vertical leakage from overlying strata (Ashworth, 1983). There are karst features, faults, and fractures throughout the Hill Country, and such features provide discrete recharge to the Trinity Aquifer. Recent studies characterize the Hill Country landscape as having streams that are hydrologically linked to the aquifer (groundwater) systems (Huntet al., 2016; Hunt et al., 2017). Aquifers provide spring flows that sustain the streams, and the streams, in turn, recharge the downstream aquifers.

In the Balcones Fault Zone (BFZ), the amount of recharge to the Trinity Aquifer is generally unknown. The Trinity is composed of the Upper, Middle, and Lower Trinity aquifers. Within the BFZ, recent studies have indicated that portions of the Upper Trinity Aquifer (Upper Glen Rose) are hydrologically connected to the Edwards Aquifer, while the lower portion of the Upper Trinity behaves as an aquitard between the Edwards and Middle Trinity aquifers (Wong et al., 2014; Hunt et al., 2016). Primary sources of recharge to the Middle Trinity Aquifer include lateral flow from the Hill Country Trinity Aquifer (Hunt et al., 2015). Significant vertical leakage from the Edwards Aquifer (stratigraphically above the Middle Trinity) is not supported by recent studies in the District. These studies indicate that the Middle Trinity is hydrologically separate from the overlying Edwards Aquifer. Geochemical and head data suggest that the Edwards and Middle Trinity aquifers can be managed independently because of the behavior of the Upper Trinity as an aquitard (Smith and Hunt, 2010; Kromann et al., 2011; Wong et al., 2014).

2.5 Annual Discharges to Springs and Surface-water Bodies, by Aquifer

Both the Edwards and Trinity aquifers of Central Texas have recently been characterized as tributary in nature, meaning that they provide flows to surface-water bodies, and they are not isolated from other aquifers (Anaya et al., 2016). The saline Edwards could be considered a nontributary aquifer as it does not provide flows to surface-water bodies and appears to be largely isolated from other aquifers.

Edwards Aquifer

The largest natural discharge point of the Barton Springs Segment of the Edwards Aquifer is Barton Springs, the fourth largest spring in Texas, and consists of four major outlets: Main, Eliza, Old Mill, and Upper. Main Spring is the largest and discharges directly into Barton Springs Pool. Springflow at Barton Springs is determined and reported by the U.S. Geological Survey (USGS). Discharge reported for Barton Springs is based on a rating-curve correlation between water levels in the Barton Well (State Well Number 5842903) and physical flow measurements from Main, Eliza, and Old Mill. Flow from Upper Barton Springs, which is located about 400 feet upstream of the pool, is not included in the reported discharge, and bypasses the pool. Upper Barton Springs is characterized as an “overflow” spring and only flows when discharge at Barton Springs exceeds about 40 cfs (Hauwert et al., 2004).

Barton Springs has a long period of continuous discharge data, beginning in 1917. Monthly mean data are available from 1917 to 1978 (Slade et al., 1986), and daily mean discharge data are available thereafter. The long-term average springflow at Barton Springs is 53 cfs based on data from 1917 to 1995, and is a widely reported value (Scanlon et al., 2001; Hauwert et al., 2004). Anaya et al. (2016) report an average value of 61 cfs and a median value of 58 cfs for flow from Barton Springs.

The maximum and minimum measured discharges are 166 and 9.6 cfs, respectively. The lowest measured spring discharge value occurred on March 26, 1956 during the 1950s drought (Slade et al., 1986). Low flow periods are defined as discharge below 35 cfs, moderate flow conditions occur between 35 to 70 cfs, and high flow conditions correspond to flows greater than 70 cfs (Hauwert et al., 2004). Mahler et al. (2006) define low flow as below 40 cfs. A peak in the daily average flow occurs in June, following the average peak rainfall in May.

Barton Springs flow is typical of a spring in a karst system with dynamic responses to recharge events and integrating a combined conduit, fracture, and matrix flow from the system. Springflow recessions and discharge rates are in large part determined by pre-existing conditions, the magnitude of recharge, and location of recharge. Massei et al. (2007) identify several source water types contributing to the conductivity measured in Barton Springs. Sources include matrix, surface water, saline-water zone, and other unidentified sources. Their relative contribution is dependent upon aquifer response to climatic and hydrologic conditions. Generally speaking, however, base springflow during periods of drought is sustained by the discharge of the matrix flow system into the conduit system (White, 1988; Mahler et al., 2006).

The Barton Springs segment of the Edwards Aquifer contains other smaller springs. Cold Springs discharges directly into the Colorado River and is partially submerged by Lady Bird Lake. There are very few discharge data for Cold Springs, but it is estimated to be about 5% of Barton Springs discharge (Scanlon et al., 2001). A small spring named Rollingwood Spring, near Cold Springs, discharges into the Colorado River at a rate of about 0.02 to 0.06 cfs. Backdoor Spring is a small, perched spring located on Barton Creek and has discharge of about 0.02 cfs. Bee Spring is a small, perched spring and seep horizon discharging along Bee Creek and into Lake Austin and discharges about 0.2 to 0.6 cfs (Hauwert et al., 2004).

The GAM Run 22-006 (Wade 2022) discussed above indicates that annual volume of water that discharges from the Edwards (BFZ) Aquifer to springs and any surface water body is 52,212 acre-feet/year (72.1 cfs).

Saline Edwards Aquifer

The saline portion of the Edwards BFZ Aquifer is confined above by younger Cretaceous-age formations of the Taylor Group. The saline portion of the aquifer, therefore, does not receive direct recharge from precipitation, nor does it discharge to springs.

Trinity Aquifer

Most of the streams and rivers in the Central Texas Hill Country were historically characterized as net-gaining for the Hill Country Trinity Aquifer region (Ashworth, 1983; Jones et al., 2009). Recent state-wide studies indicate a net gain of average annual flows to surface water from the Trinity Aquifer for Hays and Travis Counties of 57 and 51 cfs, respectively (Anaya et al., 2016). However, recent local studies have documented that surface and groundwater interactions in the Central Texas Hill Country are very complex. Streams and rivers have both losing and gaining reaches (Hunt et al., 2017). Losing stream reaches within the Hill Country provide recharge to the Trinity Aquifer. Discharge (gains) into the Hill Country streams and rivers is the source of baseflows that ultimately recharge to the Edwards Aquifer.

There are many small springs and seeps throughout the Hill Country that issue from the Upper and Middle Trinity Aquifers. Two of the larger springs in the study area are Jacob's Well, near Wimberley, and Pleasant Valley Spring near Fischer Store. Both springs are critical to the baseflows ofthe Blanco River that provide recharge to the Edwards Aquifer.

Potentiometric maps of the Hill Country indicate lateral flow in the Upper and Middle Trinity Aquifers toward the Colorado River in northwestern Hays and western Travis Counties (Mace et al., 2000; Wierman et al., 2010). As described above, most of the lateral flow in the Middle Trinity Aquifer stays within the Middle Trinity Aquifer as it enters the BFZ and does not discharge as springflow or to surface water bodies in the District (Hunt et al., 2015). Some of the flow within the upper-most portion of the Upper Trinity may flow laterally and vertically into the Edwards Aquifer, and ultimately contribute to wells and Barton Springs. No major springs are known to flow from the Trinity Aquifer within the District, since only an incidental amount of the Trinity crops out in the District.

2.6 Annual Inter-formational Inflows and Outflows

Both the Edwards and Trinity aquifers of Central Texas have recently been characterized as tributary in nature, meaning that they provide flows to surface-water bodies, and they are not isolated from other aquifers (Anaya et al., 2016). The saline Edwards could be considered a nontributary aquifer as it does not provide flows to surface-water bodies and appears to be largely isolated from other aquifers.

Edwards Aquifer
The amount of cross-formational inflow (sub-surface recharge) occurring through adjacent aquifers into the Barton Springs segment of the Edwards Aquifer is unknown, although it is thought to be relatively small on the basis of water-budget analysis for surface recharge and discharge (Slade et al., 1985; Hauwert, 2016). Recent studies by the District and others have shown the potential for some amount of cross-formational flow both to and from the Barton Springs segment of the Edwards Aquifer. Some sources of cross-formational flow are discussed below and include the saline-water zone, San Antonio segment, the Trinity Aquifer, and urban recharge.

Leakage from the saline-water zone into the freshwater zone is probably minimal, although leakage appears to influence water quality at Barton Springs during low-flow conditions (Senger and Kreitler, 1984; Slade et al., 1986). Recent studies indicate that the fresh-saline zone interface may be relatively stable over time (Lambert et al., 2010; Brakefield et al., 2015). On the basis of a geochemical evaluation, Hauwert et al. (2004) state that the saline-water zone contribution could be as high as 3% for Old Mill Springs and 0.5% for Main and Eliza Springs under low-flow conditions of 17 cfs at Barton Springs. These estimates were independently recalculated and corroborated by Johns (2006) and are similar to the results of Garner and Mahler (2005). Under normal flow conditions contribution from the saline-water zone would be smaller. Massei et al. (2007) noted that specific conductance of Barton Springs increased 20% under the 2000 drought condition, probably from saline-water zone contribution.

Subsurface flow into the Barton Springs segment of the Edwards Aquifer from the adjacent San Antonio segment located to the south is limited when compared with surface recharge (Slade et al., 1985). Hauwert et al. (2004) indicated that flow across the southern boundary is probably insignificant under normal conditions. As discussed previously, recent studies (Smith et al., 2012) have documented that the southern boundary of the Barton Springs segment of the Edwards Aquifer is hydrodynamic in nature and fluctuates between Onion Creek and the Blanco River. Accordingly, groundwater from the recharge zone of the San Antonio segment is flowing into the Barton Springs segment of the Edwards Aquifer during drought conditions (Johnson et al.,2011). Water recharged along the Blanco River can flow to both San Marcos and Barton Springs. Under extreme drought conditions, the Blanco River would be the only active surface water body providing recharge in the area. Lastly, it was estimated that up to 5 cfs of groundwater flow could bypass (underflow) San Marcos Springs and flow toward Barton Springs (Land et al., 2011).

Changes in land use influence the inflows of aquifers systems. Recent studies have shown that urbanization may increase recharge to the Edwards Aquifer (Sharp, 2010; Sharp et al., 2009). Sources of the increase in recharge include leaking infrastructure such as pressurized potable water lines, wastewater from both collector lines and septic tank drainfields, and stormwater in infiltration basins. Recharge is increased from the return flows of irrigation practices (e.g., lawn watering), and the increase in pervious cover decreases evapotranspiration (Sharp, 2010; Sharp et al., 2009; Passarello, 2011).

Saline Edwards Aquifer

As the saline Edwards (Balcones Fault Zone) Aquifer is not in direct communication with the land surface, any flows into and out of the aquifer must occur as lateral flows from the fresh portion of the aquifer to the east or as vertical flows from overlying or underlying formations. Based on information from a recent USGS study and observations of District technical staff, the saline-freshwater interface is relatively stable (Brakefield et al., 2015). That is, the movement of groundwater into the saline portion of the aquifer from the freshwater portion of the aquifer is small.

The amount of cross-formational inflow (subsurface recharge) occurring through adjacent aquifers into the Barton Springs segment of the Edwards (BFZ) Aquifer is unknown, although it is thought to be relatively small based on water-budget analyses for surface recharge and discharge (Slade et al., 1985; Hauwert, 2016).

Trinity Aquifer

Flow (or leakage) from the Trinity Aquifer into the Barton Springs segment of the Edwards Aquifer is thought to be relatively insignificant when compared with surface recharge (Slade et al., 1985; Hauwert, 2016). However, leakage from the Trinity Aquifer may nevertheless locally impact water quality and influence water levels (Senger and Kreitler, 1984; Slade et al., 1986). Based on water chemistry at Barton Springs, estimates by Hauwert et al. (2004) suggest that a small contribution of flow to the springs is from the Trinity Aquifer. As discussed previously, recent studies utilizing multiport monitoring wells have provided a lot of information about hydrologic communication between the Edwards and Upper and Middle Trinity aquifers. Results of those studies indicate that the top 100 feet of the Upper Trinity appear to be in direct hydrologic communication with the overlying Edwards. However, the remaining 350 feet of the Upper Trinity units behave effectively as an aquitard and represent a confining unit between the Edwards and the Middle Trinity. These studies indicate that the Middle Trinity is hydrologically separate from the overlying Edwards Aquifer (Smith and Hunt, 2010; Kromann et al., 2011; Wong et al., 2014).

Previously it was presumed that the flow was from the Trinity into the Edwards Aquifer. A groundwater model of the (Hill Country) Trinity Aquifer includes lateral groundwater leakage into the BFZ in order for the model to simulate observed hydrogeologic conditions in the Hill Country Trinity. Steady-state modeling indicates that as much as 8,000 acre-feet/year discharge into the Edwards (BFZ) in Travis and Hays Counties (Mace et al., 2000). However, recent data and studies suggest that the flow within the Middle Trinity units is laterally continuous (e.g. stays within the Middle Trinity) from the Hill Country into the BFZ (Smith and Hunt, 2010; Hunt et al., 2015).

Very little information is available on the Lower Trinity Aquifer and the hydrologic relationship with the overlying Middle Trinity Aquifer in the District. The Hammett Shale is a very effective aquitard, perhaps even an aquiclude in the District, and may inhibit flows into, or out of, the lower Trinity (Wierman et al. 2010).

2.7 State Water Plan Projections

As shown in Figure 2-2, the District lies rather evenly between Central Texas Water Planning Region (Region L) and the Lower Colorado Water Planning Region (Region K). While the majority of the District lies within Region L, most of the groundwater production is within Region K. The prevailing water strategies applicable to the area of the District in the two regions are similar.

This section of the Plan utilizes information provided by the TWDB in the report titled *Estimated Historical Groundwater Use and 2022 State Water Plan Datasets: BS/EACD* (TWDB 2022). The report provides county-level data that are applicable to the District and is included in this Plan as Appendix II.

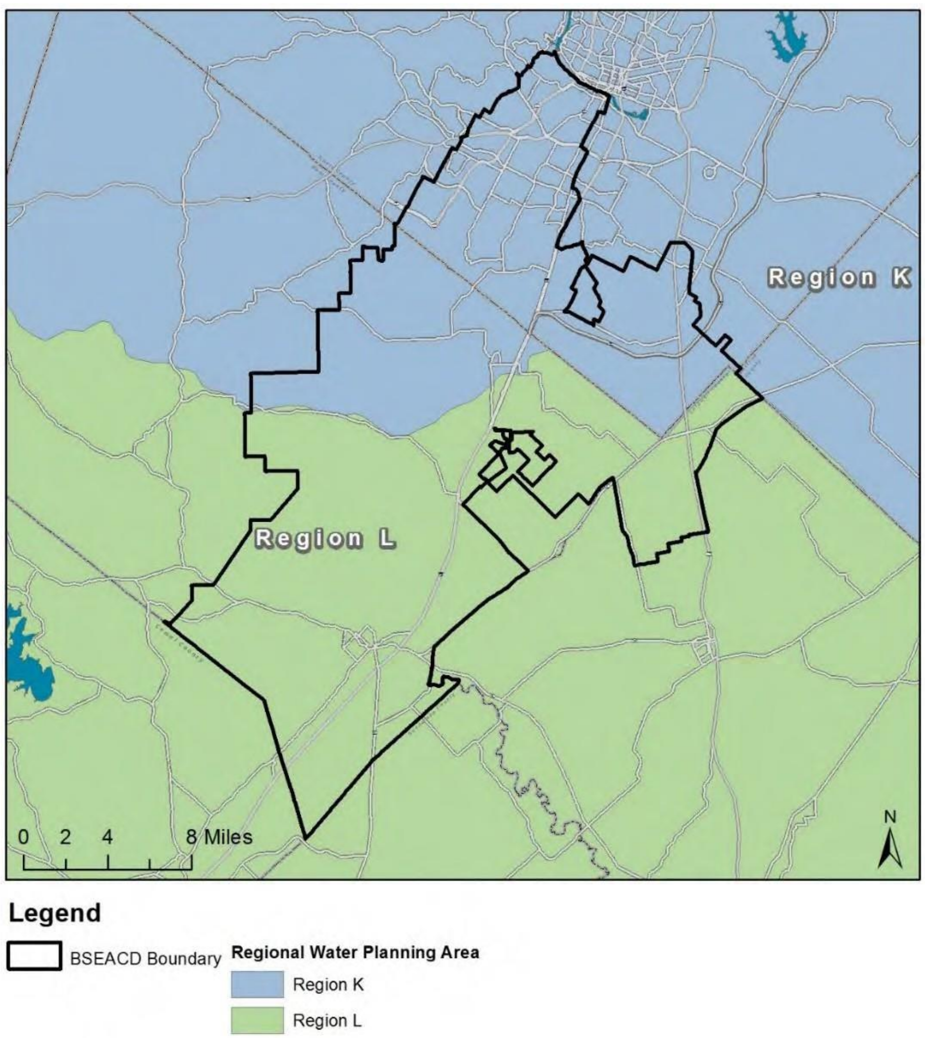


FIGURE 2-2. REGIONAL WATER PLANNING AREAS WITHIN THE DISTRICT'S BOUNDARY

2.8 Projected Surface Water Supply in District

The surface water supply in the District is provided primarily by reservoirs in the Colorado River basin. The part of the District in Hays County and Caldwell County is supplied by the Guadalupe-Blanco River system, especially water from main-stem reservoirs such as Canyon Lake. Most of this Guadalupe-Blanco water is conveyed to some users in the District by the Hays County Pipeline.

Projected water supply data have been extracted from the 2022 State Water Plan (SWP) database and provided by the TWDB (2022) at the county level (Appendix II). The projections are estimated using an apportioning multiplier (data value * (land area of the District in the county / land area of entire county)). The apportioning multiplier was used for all water user groups (WUGs) except for public water supplies (i.e., municipalities, water supply corporations, and utility districts). The derivation of these apportioning multipliers is shown in Table 2-4.

Table 2-4. Areal Distribution of District by County.

For County:	Total Area in County (acres / sq miles)	County Area in District (acres / sq miles)	County Portion of Total District Area (%)	Apportioning Multiplier (%)
Travis	654,720 / 1,023	74,880 / 117	27	11.5
Hays	435,200 / 680	183,500 / 287	67	40.5
Caldwell	350,080 / 547	17,150 / 27	6	4.5
Totals	**1,440,000 / 2250**	**275,530 / 431**	**100**	**N/A**

Note: Country area figures from U.S. Census Bureau; District area figures calculated by District staff using ArcGIS; all numbers subject to rounding.

The total projected surface water supply in the District (all counties) is estimated to be 391,242 acre-feet per year during the current decade (TWDB, 2022; Table 2-5). These supplies refer to the firm-yield supplies from surface water sources during a recurrence of the DOR. For comparison purposes, the projected annual surface water supplies from the three primary counties comprising the District are estimated in Table 2-5 by decade (acre-feet) and by applying the apportioning multiplier from Table 2-4 above.

Table 2-5. Surface Water Supplies by Decade (acre-feet/year)

	2020	2030	2040	2050	2060	2070
Travis	357,696	353,415	351,522	347,483	343,509	338,939
Hays	31,678	32,007	32,881	33,923	35,926	37,311
Caldwell	1,868	1,882	1,859	1,833	1,799	1,764
Total	**391,242**	**387,304**	**386,262**	**383,239**	**381,234**	**378,014**

2.9 Projected Total Demand for Water in District

For estimating total water demand projections, the District used data extracted from the SWP and provided by the TWDB (Appendix II). As with projected surface water supply data, county-level water demand data have been apportioned for certain WUGs using the apportioning multipliers described in Table 2-4. WUG values for municipalities, water supply corporations, and utility districts are not apportioned. Their full values are retained if they are located within the District and not included when located outside District boundaries (TWDB 2022). The TWDB provides annual demand estimates by decade as well as by county. The annual estimate for the current decade is used to approximate demand for each year this 5-year plan.

Accordingly, the total annual / apportioned demand by county for water arising from within the District in the current decade is shown below:

From Travis County in the District: 237,888 acre-feet
From Hays County in the District: 35,665 acre-feet
From Caldwell County in the District: 5,942 acre-feet

TOTAL ANNUAL DEMAND IN DISTRICT DURING CURRENT DECADE: 279,495 acre-feet

2.10 Projected Water Supply Needs

For projected water supply needs, the District used data from TWDB (2022; Appendix II). A summary of the projected annual water supply needs by decade and county is provided in Table 2-6.

Table 2-6. Projected water supply needs for each decade by county (acre-feet/year).

	2020	2030	2040	2050	2060	2070
Travis	-3,102	-6,867	-20,254	-25,866	-31,463	-43,787
Hays	-626	-4,079	-10,390	-18,751	-31,337	-48,349
Caldwell	-140	-290	-588	-1,367	-2,215	-3,060
Total	**-3,868**	**-11,236**	**-31,232**	**-45,984**	**-65,015**	**-95,196**

Note: Negative values reflect a projected water supply need, positive values reflect a surplus.

The above projections are derived from subtracting existing water supplies during a drought of record scenario from projected demand. Results indicate that without implementing additional water supply strategies, it is expected there will be a chronic and growing need for water throughout the 50-year planning period and across the portion of all counties that lies within the District. With only a couple of exceptions, water supply needs are dominated by municipal or other water utility districts. In Caldwell County, for example, water user groups (WUGs) with either immediate or future-expected needs include the Goforth Special Utility District, Martindale Water Supply Corporation, County Line Special Utility District, and the cities of Luling and Lockhart.

In Hays County, there are several WUGs with notable needs, including the City of Buda, City of Kyle, City of Hays, and the City of San Marcos. Other WUGs with needs include the Wimberley Water Supply Corporation, Dripping Springs Water Supply Corporation, Crystal Clear Water Supply Corporation, Goforth SUD, County Line SUD, and four other water suppliers.

In Travis County there is a lengthy list of domestic water suppliers with needs. Those within the BSEACD include City of Austin, Sunset Valley, Goforth SUD, and Creedmoor-Maha WSC. For a complete listing of those WUGs with water supply needs, the reader is referred to Appendix II.

The need for additional water within the District and/or within the three counties where the District resides, arises primarily from the burgeoning growth in the Greater Austin metropolitan area and I-35 corridor from Austin south to San Marcos (Figure 2-3).

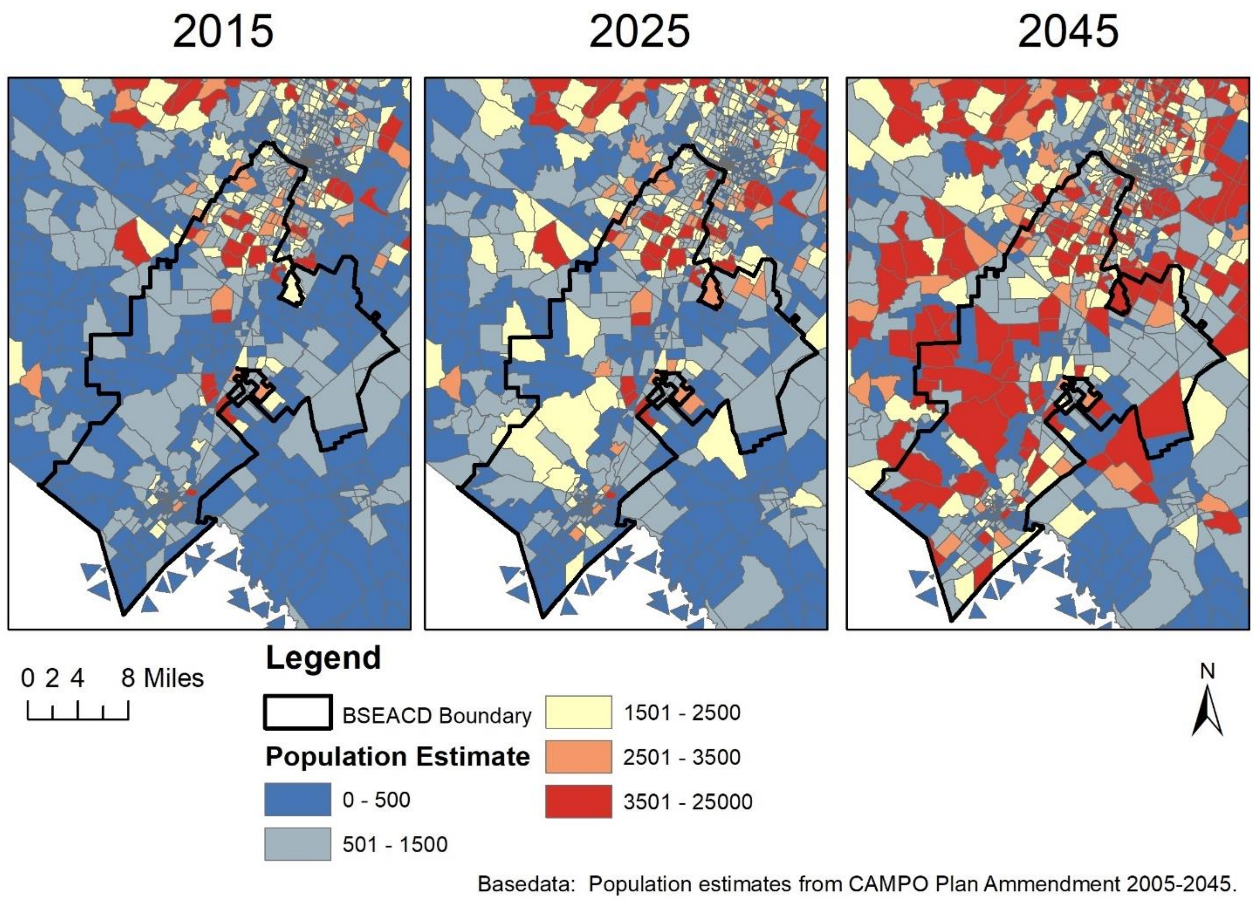


FIGURE 2-3. POPULATION FORECASTS: 2015-2045 (Capital Area Metropolitan Planning Organization 2020)

2.11 Water Management Strategies

The strategies to address the supply needs described above are identified in Appendix II. These data -- organized by decade, county, and WUG -- are extracted from the 2022 SWP and have been provided to the District by the TWDB. Key management strategies relevant to WUGs in the District and adjoining areas include:

- (Municipal Water) Conservation
- Alliance Regional Water Authority (ARWA)
- Drought Management
- Use of/Transfer from Available or Re-allocated Surface Water Supplies
- Expansion of Current Groundwater Supplies - Trinity Aquifer; Carrizo-Wilcox
- Direct Reuse; Direct Potable Reuse
- Indirect Potable Reuse
- Aquifer Storage and Recovery (ASR)
- Saline Edwards Desalination and ASR
- LCRA Mid-basin/Excess Flows Reservoir
- Water Purchase
- Rainwater Harvesting

All of the strategies listed above will be beneficial to District water users by both augmenting and diversifying water supplies. There is reason to believe, however, that many of these strategies will yield relatively expensive water as compared to costs associated with historical sources. Additionally, there is ample evidence to suggest that water-use conservation will be one of the least expensive options available to stretch or augment supplies.

2.12 Synthesis of Regional Water Supply and Demand for District Planning

The strategies for addressing water supply and demand in the District's jurisdiction identified by the regional water planning groups in the SWP are supported by the District and demonstrate the importance of local factors in determining what is available and feasible in any one area. It is under these conditions that local management of the water resources, such as is provided by local GCDs, is of paramount importance in being a vehicle for making those things happen. Effective communication among local jurisdictions and among local, regional, and state levels of government will be required to meet the water challenges in the future.

In accordance with the District's mission, the SWP strategies supported by the District will serve to facilitate conserving, preserving, and protecting its aquifers, notably the freshwater Edwards Aquifer that is already at its sustainable yield, fully appropriated, and at MAG-level production. Such efforts are necessary to allow the aquifer to continue to serve as a reliable, high-quality water supply for its existing users. Accordingly, many of the WUGs in the current SWP continue to rely on production from the freshwater Edwards Aquifer for existing needs but none have a strategy that involves increased use for future needs.

While the freshwater Edwards Aquifer is fully appropriated, demand and production from the Trinity Aquifer and other aquifers in the District is increasing and will continue to be managed to ensure long-term reliability and availability. This District intends to continue to closely coordinate and to actively participate in regional water supply planning to support the District's mission and objectives identified in this Plan.

3. Management Goals, Objectives, and Performance Standards

3.1 Actions, Procedures, Performance and Avoidance for Plan Implementation

The provisions of this Plan will be implemented by the District and will be used by the District as a guide for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District, all District policies and programs, and any additional planning efforts in which the District may participate will be consistent with the provisions of this Plan. The District will encourage cooperation and coordination with relevant entities in the implementation of this Plan. All operations and activities of the District will be performed in a manner that best encourages and fosters cooperation with state, regional, and local water entities.

The District will utilize this Plan as a guide for the on-going establishment and evaluation of District's programmatic activities. The District will adopt rules necessary to support the District's mission including rules related to the permitting of wells, the production and transport of groundwater, and drought management. The rules and policies established by the District shall be consistent with the provisions of this Plan and shall be adopted on the basis of the best available science, public and stakeholder input, and recommendations of competent professionals. Further, the rules shall comply with TWC Chapter 36 and the District's enabling legislation. All rules will be adhered to and enforced in a manner that is fair and objective. A copy of the Rules can be found on the District's website here: http://bseacd.org/about-us/governing-documents/.

3.2 Methodology for Tracking District Progress in Achieving Management Goals

In order to achieve the goals, management objectives, and performance standards adopted in this Plan, the District shall continually work to develop, maintain, review, and update rules, policies, and procedures for the various programs and activities contained in the Plan. As a means to monitor performance, the General Manager will provide direction on activities throughout the year and routinely meet with staff to track interim progress on the various goals, management objectives, and performance standards adopted in this Plan.

On an annual basis, the General Manager will prepare an annual report documenting progress made towards implementation of the management plan and achievement of the goals and objectives. The General Manager will present the annual report to the Board to assist the Board's evaluation of the progress made, and to consider approval. Once approved by the Board, a copy of the annual report will remain on file at the District's office for members of the public to access as well as made available on the website, and then submitted to the relevant entities pursuant to District Rules and Bylaws.

3.3 Goals and Strategies

The Texas Water Development Board (TWDB) has specified eight overarching management goals to be addressed in the groundwater management planning performed by all GCDs in Texas. These goals are prescribed in accordance with TWC Chapter 36.1071 and provide the framework for specific objectives and performance standards defined by each individual GCD. Each of the established TWDB goals are identified and characterized in this Plan by the relevant objectives and performance standards as defined by the District to serve its mission. The strategies embodied in this Plan are integrated and integral to: 1) achieving the DFCs in compliance with state law, and 2) the measures of the District's HCP in compliance with the prospective ITP and federal law (see Section 1.5, Management of Groundwater Resources in the District).

This Plan establishes the District's scope of activities, and in concert with legal statutes and enabling authority, will:

- Serve as a planning tool for the District in its management and operations;
- Provide general information about the District and its groundwater resources;
- Provide technical information concerning groundwater resources, water supply, and demand;
- Establish management objectives and performance standards relative to each of the prescribed goals;
- Serve as a resource to help guide the District's development of additional technical information on local groundwater resources, use, and demand; and
- Support the District's development of its regulatory program.

The Board sets policies embodied in this Plan, adopts rules and bylaws, and takes action in accordance with the Rules and Bylaws to implement this Plan and execute the District's mission. The General Manager reports to and is directed by the Board and is responsible for the overall operations and day-to-day activities of the District.

GOAL 1 - Providing the Most Efficient Use of Groundwater – 31 TAC 356.52(a)(1)(A)/TWC §36.1071(a)(1)

	Management Plan Objectives	Performance Standards
1-1	Provide and maintain on an ongoing basis a sound statutory, regulatory, financial, and policy framework for continued District operations and programmatic needs.	A. Develop, implement, and revise as necessary, the District Management Plan in accordance with state law and requirements. Each year, the Board will evaluate progress towards satisfying the District goals. A summary of the Board evaluation and any updates or revisions to the management plan will be provided in the annual report. B. Review and modify District Rules as warranted to provide and maintain a sound statutory basis for continued District operations and to ensure consistency with both District authority and programmatic needs. A summary of any rule amendments adopted in the previous fiscal year will be included in the annual report.
1-2	Monitor aggregated use of various types of water wells in the District, as feasible and appropriate, to assess overall groundwater use and trends on a continuing basis.	Monitor annual withdrawals from all nonexempt wells through required monthly or annual meter reports to ensure that groundwater is used as efficiently as possible for beneficial use. A summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type will be provided in the annual report.
1-3	Evaluate quantitatively at least every five years the amount of groundwater withdrawn by exempt wells in the District to ensure an accurate accounting of total withdrawals in a water budget that includes both regulated and non-regulated withdrawals, so that appropriate groundwater management actions are taken.	A. Provide an estimate of groundwater withdrawn by exempt wells in the District using TDLR and TWDB databases and District well records, and update the estimate every five years with the District's management plan updates. B. In the interim years between management plan updates, the most current estimates of exempt well withdrawals will be included in a summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type that will be provided in the annual report.
1-4	Develop and maintain programs that inform and educate citizens of all ages about groundwater and springflow-related matters, which affect both water supplies and salamander ecology.	A. Publicize District drought trigger status (Barton Springs 10-day average discharge and Lovelady Monitor Well water level) in d quarterly newsletter, on the District website, and on the District's social media channels. B. Provide summaries of associated outreach and education programs, events, workshops, and meetings in the monthly team activity reports in the publicly-available Board backup. C. A summary of outreach activities and estimated reach will be provided in the annual report.
1-5	Ensure responsible and effective management of District finances such that the District has the near-term and long-term financial means to support its mission.	A. Receive a clean financial audit each year. A copy of the auditor's report will be included in the annualreport. B. Timely develop and approve fiscal-year budgets and amendments. The dates for public hearings andBoard approval of the budget and any amendments will be provided in the annual report.

1-6	Provide efficient administrative support and infrastructure, such that District operations are executed reliably and accurately, meet staff and local stakeholder needs, and conform to District policies and with federal and state requirements.	A. Maintain, retain, and control all District records in accordance with the Texas State Library and Archives Commission-approved District Records Retention Schedule to allow for safekeeping and efficient retrieval of any and all records, and annually audit records for effective management of use, maintenance, retention, preservation and disposal of the records' life cycle as required by the Local Government Code. A summary of records requests received under the PIA, any training provided to staff or directors, or any claims of violation of the Public Information Act will be provided in the annual report. B. Develop, post, and distribute District Board agendas, meeting materials, and backup documentation in a timely and required manner; post select documents on the District website, and maintain official records, files, and minutes of Board meetings appropriately. A summary of training provided to staff or directors or any claims of violation of the Open Meetings Act will be provided in the annual report.
1-7	Manage and coordinate electoral process for Board members.	Ensure elections process is conducted and documented in accordance with applicable requirements and timelines. Elections documents will be maintained on file and a summary of elections-related dates and activities will be provided in the annual report for years when elections occur.

GOAL 2 - Controlling and Preventing Waste of Groundwater – 31 TAC 356.52(a)(1)(B)/TWC §36.1071(a)(2))

	Management Plan Objectives	Performance Standards
2-1	Require all newly drilled exempt and nonexempt wells, and all plugged wells to be registered and to comply with applicable District Rules, including Well Construction Standards.	A summary of the number and type of applications processed and approved for authorizations, permits, and permit amendments including approved use types and commensurate permit volumes for production permits and amendments will be provided in the annual report.
2-2	Ensure permitted wells and well systems are operated as intended by requiring reporting of periodic meter readings, making periodic inspections of wells, and reviewing pumpage compliance at regular intervals that are meaningful with respect to the existing aquifer conditions.	A. Inspect all new wells for compliance with the Rules, and Well Construction Standards, and provide a summary of the number and type of inspections or investigations in the annual report. B. Provide a summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type in the annual report.
2-3	Provide leadership and technical assistance to government entities, organizations, and individuals affected by groundwater-utilizing land use activities, including support of or opposition to legislative initiatives or projects that are inconsistent with this objective.	A. In even-numbered fiscal years, provide a summary of interim legislative activity and related District efforts in the annual report. In odd-numbered fiscal years, provide a legislative debrief tothe Board on bills of interest to the District and provide a summary in the annual report. B. Provide a summary of District activity related to other land use activities affecting groundwater in the annual report.
2-4	Ensure all firm-yield production permits are evaluated with consideration given to the demand-based permitting standards including verification of beneficial use that is commensurate with reasonable non-speculative demand.	A summary of the number and type of applications processed and approved for authorizations, permits, and permit amendments including approved use types and commensurate permit volumes for production permits and amendments will be provided in the annual report.

GOAL 3 - Addressing Conjunctive Surface Water Management Issues – 31 TAC 356.52(a)(1)(D)/TWC §36.1071(a)(4)

	Management Plan Objectives	Performance Standards
3-1	Assess the physical and institutional availability of existing regional surface water and alternative groundwater supplies and the feasibility of those sources as viable supplemental or substitute supplies for District groundwater users.	Identify available alternative water resources and supplies that may facilitate source substitution and reduce demand on the Edwards Aquifer, while increasing regional water supplies, and evaluate feasibility by considering: 1. available/proposed infrastructure, 2. financial factors, 3. logistical/engineering factors, and 4. potential secondary impacts (development density/intensity or recharge water quality). A summary of District activity related to this objective will be provided in the annual report.
3-2	Encourage and assist District permittees to diversify their water supplies by assessing the feasibility of alternative water supplies and fostering arrangements with currently available alternative water suppliers.	Identify available alternative water resources and supplies that may facilitate source substitution and reduce demand on the Edwards Aquifer, while increasing regional water supplies, and evaluate feasibility by considering: 1. available/proposed infrastructure, 2. financial factors, 3. logistical/engineering factors, and 4. potential secondary impacts (development density/intensity or recharge water quality). A summary of District activity related to this objective will be provided in the annual report.
3-3	Demonstrate the importance of the relationship between surface water and groundwater, and the need for implementing prudent conjunctive use through educational programs with permittees and public outreach programs.	A. Provide summaries of associated outreach and education programs, events, workshops, and meetings in the monthly team activity reports in the publicly-available Board backup. B. Summarize outreach activities and estimate reach in the annual report.
3-4	Actively participate in the regional water planning process to provide input into policies, planning elements, and activities that affect the aquifers managed by the District.	Regularly attend regional water planning group meetings and annually report on meetings attended.

GOAL 4 - Addressing Natural Resource Issues which Impact the Use and Availability of Groundwater, and which are Impacted by the Use of Groundwater – 31 TAC 356.52 (a)(1)(E)/TWC §36.1071(a)(5)

	Management Plan Objectives	Performance Standards
4-1	Assess ambient conditions in District aquifers on a recurring basis by: 1. sampling and collecting groundwater data from selected wells and springs monthly; 2. conducting scientific investigations as indicated by new data and models to better determine groundwater availability for the District aquifers; and 3. conducting studies as warranted to help increase understanding of the aquifers and, to the extent feasible, detect possible threats to water quality and evaluate their consequences.	A. Review water-level and water-quality data that are maintained by the District and/or TWDB, or other agencies, on a regular basis. B. Improve existing analytical or numerical models or work with other organizations on analytical or numerical models that can be applied to the aquifers in the District. C. A review of the data mentioned above will be assessed for significant changes and reported in the annual report.
4-2	Evaluate site-specific hydrogeologic data from applicable production permits to assess potential impact of withdrawals to groundwater quantity and quality, public health and welfare, contribution to waste, and unreasonable well interference.	This involves evaluations of certain production permit applications for the potential to cause unreasonable impacts as defined by District rule. To evaluate the potential for unreasonable impacts, staff will: 1. Perform a technical evaluation of the application, aquifer test, and hydrogeological report; 2. Use best available science and analytical tools to estimate amount of drawdown from pumping and influence on other water resources; and 3. Recommend proposed permit conditions to the Board for avoiding unreasonable impacts if warranted. A list of permit applications that are determined to have potential for unreasonable impacts will be provided in the annual report.
4-3	Implement separate management zones and, as warranted, different management strategies to address more effectively the groundwater management needs for the various aquifers in the District.	A. Increase the understanding of District aquifers by assessing aquifer conditions, logging wells, and collecting water quality data. A summary of the number of water quality samples performed will be provided in the annual report. B. A summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type will be provided in the annual report.

4-4	Actively participate in the joint planning processes for the relevant aquifers in the District to establish and refine Desired Future Conditions (DFCs) that protect the aquifers and the Covered Species of the District's Habitat Conservation Plan (HCP).	Attend at least 75% of the GMA meetings and annually report on meetings attended, GMA decisions on DFCs, and other relevant GMA business.
4-5	Implement the measures of the District HCP and Incidental Take Permit (ITP) from the U.S. Fish & Wildlife Service (USFWS) for the covered species and covered activity to support the biological goals and objectives of the HCP.	Prior to ITP permit issuance, a progress report summarizing activities related to the USFWS review of the ITP application will be provided in the annual report. Upon ITP issuance, the HCP annual report documenting the District's activities and compliance with ITP permit requirements will be incorporated into the annual report by reference.

GOAL 5 - Addressing Drought Conditions – 31 TAC 356.52 (a)(1)(F)/TWC §36.1071(a)(6)

	Management Plan Objectives	Performance Standards
5-1	Adopt and keep updated a science-based drought trigger methodology, and frequently monitor drought stages on the basis of actual aquifer conditions, and declare drought conditions as determined by analyzing data from the District's defined drought triggers and from existing and such other new drought-declaration factors, especially the prevailing DO concentration trends at the spring outlets, as warranted.	A. During periods of District-declared drought, prepare a drought chart at least monthly to report the stage of drought and the conditions that indicate that stage of drought. During periods of non-drought, prepare the drought charts at least once every three months. B. A summary of the drought indicator conditions and any declared drought stages and duration will be provided in the annual report.
5-2	Implement a drought management program that step-wise curtails freshwater Edwards Aquifer use to at least 50% by volume of 2014 authorized aggregate monthly use during Extreme Drought, and that designs/uses other programs that provide an incentive for additional curtailments where possible. For all other aquifers, implement a drought management program that requires mandatory monthly pumpage curtailments during District-declared drought stages.	During District-declared drought, enforce compliance with drought management rules to achieve overall monthly pumpage curtailments within 10% of the aggregate curtailment goal of the prevailing drought stage. A monthly drought compliance report for all individual permittees will be provided to the Board during District-declared drought, and a summary will be included in the annual report.
5-3	Inform and educate permittees and other well owners about the significance of declared drought stages and the severity of drought, and encourage practices and behaviors that reduce water use by a stage-appropriate amount.	A. During District-declared drought, publicize declared drought stages and associated demand reduction targets in quarterly and monthly eNews bulletins, continuously on the District website, and social media channels. B. A summary of drought and water conservation related newsletter articles, press releases, and drought updates sent to Press, Permittees, Well Owners and eNews subscribers will be provided in the annual report.

5-4	Assist and, where feasible, incentivize individual freshwater Edwards Aquifer historic-production permittees in developing drought planning strategies to comply with drought rules, including: 1. pumping curtailments by drought stage to at least 50% of the 2014 authorized use during Extreme Drought, 2. "right-sizing" authorized use over the long term to reconcile actual water demands and permitted levels, and 3. as necessary and with appropriate conditions, the source substitution with alternative supplies.	A. Require an updated UCP/UDCP from Permittees within one year of each five-year Management Plan Adoption. B. Provide a summary of any activity related to permit right sizing or source substitution with alternative supplies that may reduce demand on the freshwater Edwards Aquifer in the annual report.
5-5	Implement a Conservation Permit that is held by the District and accumulates and preserves withdrawals from the freshwater Edwards Aquifer that were previously authorized with historic-use status and that is retired or otherwise additionally curtailed during severe drought, for use as ecological flow at Barton Springs during Extreme Drought and thereby increase springflow for a given set of hydrologic conditions.	A summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type including the volume reserved in the freshwater Edwards Conservation Permit for ecological flows will be provided in the annual report.

GOAL 6 - Addressing Conservation and Rainwater Harvesting where Appropriate and Cost-Effective – 31TAC 356.52 (a)(1)(G)/TWC §36.1071(a)(7)

	Management Plan Objectives	Performance Standards
6-1	Develop and maintain programs that inform, educate, and support District permittees in their efforts to educate their end-user customers about water conservation and its benefits, and about drought-period temporary demand reduction measures.	A. A summary of efforts to assist permittees in developing drought and conservation messaging strategies will be provided in annual report. B. Publicize declared drought stages and associated demand reduction targets monthly in eNews bulletins and continuously on the District website.
6-2	Encourage use of conservation-oriented rate structures by water utility permittees to discourage egregious water demand by individual end-users during declared drought.	On an annual basis, the District will provide an informational resource or reference document to all Public Water Supply permittees to serve as resources related to conservation best management strategies and conservation-oriented rate structures.
6-3	Develop and maintain programs that educate and inform District groundwater users and constituents of all ages about water conservation practices and the use of alternate water sources such as rainwater harvesting, gray water, and condensate reuse.	Summarize water conservation related newsletter articles, press releases, and events in the annual report. Summary will describe the preparation and dissemination of materials shared with District groundwater users and area residents that inform them about water conservation and alternate water sources.

GOAL 7 - Addressing Recharge Enhancement where Appropriate and Cost-Effective – 31TAC 356.52 (a)(1)(G)/TWC §36.1071(a)(7)

	Management Plan Objectives	Performance Standards
7-1	Improve recharge to the freshwater Edwards Aquifer by conducting studies and, as feasible and allowed by law, physically altering (cleaning, enlarging, protecting, diverting surface water to) discrete recharge features that will lead to an increase in recharge and water in storage beyond what otherwise would exist naturally.	Maintaining the functionality of the Antioch system will be the principal method for enhancing recharge to the freshwater Edwards Aquifer. Additional activities may be excavating sinkholes and caves within the District. A summary of all recharge improvement activities will be provided in the annual report.
7-2	Conduct technical investigations and, as feasible, assist water-supply providers in implementing engineered enhancements to regional supply strategies, including desalination, aquifer storage and recovery, effluent reclamation and re-use, and recharge enhancement of surface water (including floodwater) to increase the options for water-supply substitution and reduce dependence on the aquifer.	Assess progress toward enhancing regional water supplies in the annual report.

GOAL 8 - Addressing the Desired Future Conditions of the Groundwater Resources – 31TAC (a)(1)(H)/TWC §36.1071(a)(8)

	Management Plan Objectives	Performance Standards
8-1	**Freshwater Edwards Aquifer All-Conditions DFC**: Adopt rules that restrict, to the greatest extent practicable, the total amount of groundwater authorized to be withdrawn annually from the aquifer to an amount that will not substantially accelerate the onset of drought conditions in the aquifer; this is established as a running seven-year average springflow at Barton Springs of no less than 49.7 cfs during average recharge conditions.	A. A summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type will be provided in the annual report. B. Upon ITP issuance, the HCP annual report documenting the District's activities and compliance with ITP permit requirements will be incorporated into the annual report by reference. C. Upon ITP issuance, compile a summary of aquifer data including: 1) the frequency and duration of District-declared drought, 2) levels of the aquifer as measured by springflow and indicator wells (including temporal and spatial variations), and 3) total annual and daily discharge from Barton Springs will be provided in the annual report.
8-2	**Freshwater Edwards Aquifer Extreme Drought DFC:** Adopt rules that restrict, to the greatest extent practicable and as legally possible, the total amount of groundwater withdrawn monthly from the Aquifer during Extreme Drought conditions in order to minimize take and avoid jeopardy of the Covered Species as a result of the Covered Activities, as established by the best science available. This is established as a limitation on actual withdrawals from the aquifer to a total of no more than 5.2 cfs on an average annual (curtailed) basis during Extreme Drought, which will produce a minimum springflow of not less than 6.5 cfs during a recurrence of the drought of record (DOR).	A. A summary of the volume of aggregate groundwater withdrawals permitted and actually produced from permitted wells for each Management Zone and permit type will be provided in the annual report. B. Upon ITP issuance, the HCP annual report documenting the District's activities and compliance with ITP permit requirements will be incorporated into the annual report by reference. C. Upon ITP issuance, compile a summary of aquifer data including: 1) the frequency and duration of District-declared drought, 2) levels of the aquifer as measured by springflow and indicator wells (including temporal and spatial variations), and 3) total annual and daily discharge from Barton Springs will be provided in the annual report.
8-3	Implement appropriate rules and measures to ensure compliance with District-adopted DFCs for each relevant aquifer or aquifer subdivision in the District.	Develop and implement a cost-effective method for evaluating and demonstrating compliance with the DFCs of the relevant aquifers in the District, in collaboration with other GCDs in the GMAs. Prior to method implementation, provide a summary of activities related to method development in the annual report. Once developed, provide a summary of data for each District-adopted DFC for each relevant aquifer indicating aquifer conditions relative to the DFC and provide in the annual report.

3.4 TWDB Goals determined not applicable to the District –

- **Controlling and Preventing Subsidence. – 31TAC (a)(1)(H)/TWC §36.1071(a)(8)**
- **Precipitation Enhancement – 31 TAC 356.52(a)(1)(G); TWC §36.1071(a)(7)**
- **Brush Control – 31 TAC 356.52(a)(1)(G); TWC §36.1071(a)(7)**

This category of management goal is not considered applicable to the District because the formations making up the aquifers of use are consolidated with little potential for subsidence within the District as a result of groundwater usage. Mace et al., (1994) studies the potential for subsidence resulting from the significant historical level declines observed in the northern Trinity Aquifer in Central Texas. They concluded that even in the confined portions of the aquifer, where the largest declines have occurred, the subsidence expected would be only a small amount that would take a very long time to manifest itself. More recently, a study was conducted for the Texas Water Development Board that aimed to identify areas of vulnerability to subsidence due to groundwater pumping in the major and minor aquifers of Texas outside of the Houston-Galveston and Fort Bend Subsidence Districts (Furnans et al. 2017). This report, considered to be the best available science on subsidence in Texas, concludes (pg. 4-22) that the Edwards Balcones Fault Zone – one of two major aquifers within the District as noted above – has a very low risk for future subsidence due to pumping. However, there is a minor risk of local subsidence due to dissolution of the aquifer material and subsequent collapse. For the other major aquifer, the Trinity Aquifer, the report indicates (pg. 4-78) that the eastern portions (i.e., downdip) of the aquifer have the greatest risk for future subsidence due to pumping. Furnans et al. (2017) qualify this assessment with a reference to the Mace et al. (1994) study where it is noted that land surface subsidence has not been observed (in the Trinity Aquifer) despite significant water level declines. There are no minor aquifers within the District.

After review by the Board of Directors, the General Manager, and the District's technical consultants, it has been determined that precipitation enhancement, and brush control are not appropriate groundwater management strategies for the District. This evaluation is based on costs of operating and maintaining theseprograms and probable lack of effectiveness or constituent participation in these programs, due to the climate, hydrogeology, and physiography of the District.

4. Coordination with Other Water Management Entitles

4.1 Coordination with Regional Planning Entities

The District has actively contributed to and participated in the development of the Lower Colorado Regional Water Plan (Region K). While most of the Edwards Aquifer production within the District occurs within the planning area of Region K, some large Edwards Aquifer production is permitted within the planning area of South Central Texas Regional Water Plan (Region L). Additionally, the District expanded its jurisdictional area over the Trinity Aquifer in 2015 to include central and eastern Hays County which extended the District further into the Region L. As such, the District is also engaged and actively participates in the development of the Region L plan. Figure 2-2 is a map that shows the spatial relationship of the District with these two Regional Water Planning Groups. For regional water planning purposes in both Region K and L, groundwater availability from the District's relevant aquifers is determined by the TWDB-calculated MAG estimates for the District's adopted DFCs. These estimates are shown in Table 2-2.

Letters evidencing District coordination with the Regional Planning Groups on this Plan are in Appendix I. The District intends to continue to participate actively in the regional water planning activities through voting membership representing GMA 10 on Region K and by attending meetings and providing information to Region L during the term of this Plan.

Other Resource Management Agencies

In July 2018, the U.S. Fish and Wildlife Service published in the Federal Register (Vol. 83, No. 137/Tuesday, July 17, 2018/Notices) their decision to issue an ITP, effective for 20 years, for implementation of the BSEACD HCP. This permit authorizes the incidental take of two listed salamanders under the Endangered Species Act of 1973 (Public Law 93-205). The HCP is tied to the District's management plan and both plans are designed to protect the two listed species – the Barton Springs salamander (*Eurycea sosorum*) and the Austin blind salamander (*Eurycea waterlooensis)* – that use the natural outflows of the Edwards Aquifer at Barton Springs as key habitat. Changes in the groundwater management measures used by the District must not only be consistent with the prevailing Plan but also potentially must be authorized by the Service via a change to the ITP.

Related to the HCP/ITP, the BSEACD entered into an Interlocal Agreement (ILA) with the City of Austin in the spring of 2019 "to collaborate and coordinate on routine and planned communication, public education, flow/aquifer level measurement, monitoring, regional issues, recharge enhancements, and groundwater pumping matters to make other related commitments" as outlined in the ILA.

4.2 Coordination with Regional Groundwater Management Entities

The District participates in and contributes to the joint regional planning being conducted by Groundwater Management Areas (GMA) 10, as authorized and required by TWC §36.108 (see Figure 1-8). The purpose of this recurring joint planning is to develop and revise, as necessary, feasible Desired Future Conditions (DFCs) for all relevant aquifers being managed by the groundwater conservation districts (GCDs) in the GMA; these represent consensus views of what characteristics are intended that the aquifers should have during and/or at the end of the 50-year planning term. TWDB uses groundwater availability models or the best available analytical tools to convert those DFCs to estimates of the MAG, which comprise the approved volumetric basis for regional water planning, and constitute one of the important considerations in groundwater permitting and related regulatory programs for the GCDs.

GMA 10 focuses on the Edwards Aquifer, but includes other major and minor aquifers within its geographic boundaries. For the District, the Trinity aquifers (e.g., upper, middle, and lower) and the Edwards Aquifers, both its freshwater and saline-water zones in GMA 10, are of regulatory interest and are included, therefore, in the joint planning activity.

The joint planning process has produced a set of DFCs that are applicable to and relevant for the District. The TWDB has estimated the corresponding MAGs for the District that are key considerations in its permitting programs. The current DFCs for the District's relevant aquifers and the associated MAGs applicable to the District are shown in Table 2-2. This Plan has regulatory, educational, and scientific programs that are consistent with achieving and/or maintaining these DFCs during the term of the Plan.

APPENDICES

I. Supporting Documentation:
   A. Resolution Adopting the Management Plan
   B. Evidence that the Management Plan was Adopted after Notice and Hearing
   C. Evidence that the District Coordinated Development of the Management Plan with Other Regional Entities (Planning Groups, GMAs, Surface Water Entities, Groundwater Entities)

II. Estimated Historical Water Use and State Water Plan Datasets

III. TWDB Groundwater Availability Model Run

I. Supporting Documentation

A. Resolution Adopting the Management Plan
B. Evidence that the Management Plan was Adopted after Notice and Hearing
C. Evidence that the District Coordinated Development of the Management Plan withOther Regional Entities (Planning Groups, GMAs, Surface Water Entities, Groundwater Entities)

A. Resolution Adopting the Management Plan

B. Evidence that the Management Plan was Adopted after Notice and Hearing

II. Estimated Historical Water Use and State Water Plan Datasets

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Barton Springs/Edwards Aquifer Conservation District

by Stephen Allen Texas Water Development Board
Groundwater Division Groundwater Technical Assistance Section stephen.allen@twdb.texas.gov
(512) 463-7317
February 18, 2022

GROUNDWATER MANAGEMENT PLAN DATA:

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five- year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

http://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf

The five reports included in this part are:

1. Estimated Historical Groundwater Use (checklist item 2)

from the TWDB Historical Water Use Survey (WUS)

2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)

from the 2022 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2022 SWP data available as of 2/18/2022. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2022 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

The values presented in the data tables of this report are county-based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district, and eliminated when they are located outside (we ask each district to identify these entity locations).

The remaining SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not modified because district-specific values are not statutorily required. Each district needs only "consider" the county values in these tables.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not perfect but it is the best available process with respect to time and staffing constraints. If a district believes it has data that is more accurate it can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317).

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2020. TWDB staff anticipates the calculation and posting of these estimates at a later date.

CALDWELL COUNTY

4.54% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	81	0	0	0	22	10	113
	SW	139	1	0	0	10	42	192
2018	GW	78	0	0	0	21	10	109
	SW	146	1	0	0	6	42	195
2017	GW	88	0	0	0	18	9	115
	SW	142	0	0	0	8	39	189
2016	GW	83	0	0	0	18	6	107
	SW	138	1	0	0	4	26	169
2015	GW	82	0	0	0	19	6	107
	SW	133	0	0	0	2	25	160
2014	GW	92	0	0	0	30	7	129
	SW	134	0	0	0	3	28	165
2013	GW	92	0	0	0	26	6	124
	SW	132	0	0	0	2	27	161
2012	GW	107	0	0	0	34	6	147
	SW	142	0	0	0	4	27	173
2011	GW	137	0	0	0	46	8	191
	SW	143	0	0	0	3	30	176
2010	GW	120	0	0	0	32	8	160
	SW	140	0	0	0	2	31	173
2009	GW	123	0	0	0	6	7	136
	SW	130	0	0	0	1	30	161
2008	GW	112	0	0	0	11	8	131
	SW	142	0	0	0	52	32	226
2007	GW	80	0	0	0	3	9	92
	SW	140	0	0	0	53	38	231
2006	GW	140	0	0	0	15	8	163
	SW	123	0	0	0	0	35	158
2005	GW	99	0	0	0	13	12	124
	SW	111	0	0	0	1	49	161
2004	GW	169	0	0	0	7	3	179
	SW	62	0	0	0	1	44	107

HAYS COUNTY

40.47% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	4,542	66	122	0	197	33	4,960
	SW	6,983	0	0	416	5	950	8,354
2018	GW	4,026	64	123	0	168	33	4,414
	SW	6,785	0	0	407	0	993	8,185
2017	GW	4,149	62	140	0	150	32	4,533
	SW	6,527	0	0	409	73	1,003	8,012
2016	GW	4,226	56	107	0	171	38	4,598
	SW	5,483	0	0	563	10	1,259	7,315
2015	GW	3,648	72	121	0	105	38	3,984
	SW	5,607	0	0	643	76	1,212	7,538
2014	GW	3,738	75	151	308	251	35	4,558
	SW	5,366	0	0	0	0	1,302	6,668
2013	GW	4,852	73	151	403	185	33	5,697
	SW	5,302	0	0	0	2	1,128	6,432
2012	GW	5,348	78	200	0	265	29	5,920
	SW	5,396	1	0	0	33	991	6,421
2011	GW	5,710	69	136	0	357	40	6,312
	SW	5,424	1	0	0	4	947	6,376
2010	GW	5,332	61	273	0	266	40	5,972
	SW	3,538	2	141	0	4	1,109	4,794
2009	GW	4,868	63	268	0	295	123	5,617
	SW	3,542	0	137	0	0	1,154	4,833
2008	GW	4,899	71	263	0	290	121	5,644
	SW	3,217	0	134	0	10	2,581	5,942
2007	GW	4,182	56	136	0	496	128	4,998
	SW	2,822	2	4	0	82	1,569	4,479
2006	GW	4,975	75	140	0	98	124	5,412
	SW	2,580	0	0	0	1	1,388	3,969
2005	GW	4,289	73	140	0	57	113	4,672
	SW	2,138	2	0	0	11	1,373	3,524
2004	GW	4,164	63	140	0	51	80	4,498
	SW	1,945	4	0	0	128	1,706	3,783

TRAVIS COUNTY

11.47% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	1,636	79	0	9	207	9	1,940
	SW	19,263	1,256	8	328	69	37	20,961
2018	GW	1,992	82	0	9	195	9	2,287
	SW	18,446	1,203	0	160	68	37	19,914
2017	GW	2,271	80	0	9	213	8	2,581
	SW	18,426	1,387	0	91	29	35	19,968
2016	GW	2,126	79	0	9	202	9	2,425
	SW	17,773	1,152	0	84	47	38	19,094
2015	GW	1,831	84	0	0	86	9	2,010
	SW	17,106	1,104	0	109	1,213	38	19,570
2014	GW	1,868	89	0	0	119	9	2,085
	SW	17,015	967	0	310	962	36	19,290
2013	GW	2,184	88	0	0	195	11	2,478
	SW	17,762	1,034	0	371	493	44	19,704
2012	GW	2,141	69	0	0	135	11	2,356
	SW	19,144	1,008	13	422	384	45	21,016
2011	GW	2,698	50	0	0	330	14	3,092
	SW	21,226	901	13	1,019	344	58	23,561
2010	GW	2,133	92	142	0	83	14	2,464
	SW	18,430	777	205	344	344	57	20,157
2009	GW	1,813	87	135	0	32	15	2,082
	SW	19,195	912	310	581	475	61	21,534
2008	GW	1,495	105	128	0	145	14	1,887
	SW	20,211	1,282	319	855	458	54	23,179
2007	GW	1,417	93	0	0	87	13	1,610
	SW	17,287	1,219	108	878	391	53	19,936
2006	GW	1,515	114	0	0	234	13	1,876
	SW	20,806	1,233	185	715	344	51	23,334
2005	GW	1,714	109	0	0	171	15	2,009
	SW	18,423	1,293	362	488	362	60	20,988
2004	GW	1,532	145	0	0	90	30	1,797
	SW	16,656	1,273	222	1,138	535	35	19,859

Projected Surface Water Supplies

TWDB 2022 State Water Plan Data

CALDWELL COUNTY

4.54% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	COUNTY LINE SUD	GUADALUPE	CANYON LAKE/RESERVOIR	403	403	371	340	306	270
L	COUNTY-OTHER, CALDWELL	GUADALUPE	GUADALUPE RUN-OF-RIVER	0	0	0	0	0	0
L	GONZALES COUNTY WSC	GUADALUPE	CANYON LAKE/RESERVOIR	9	10	11	12	12	13
L	LIVESTOCK, CALDWELL	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	1	1	1	1	1	1
L	LIVESTOCK, CALDWELL	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	21	21	21	21	21	21
L	MARTINDALE WSC	GUADALUPE	CANYON LAKE/RESERVOIR	226	224	222	220	218	218
L	MARTINDALE WSC	GUADALUPE	GUADALUPE RUN-OF-RIVER	11	11	11	11	11	11
L	MAXWELL WSC	GUADALUPE	CANYON LAKE/RESERVOIR	694	710	720	724	727	727
L	MAXWELL WSC	GUADALUPE	GUADALUPE RUN-OF-RIVER	9	10	10	10	10	10
L	SAN MARCOS	GUADALUPE	CANYON LAKE/RESERVOIR	2	2	2	3	3	3
L	TRI COMMUNITY WSC	GUADALUPE	GUADALUPE RUN-OF-RIVER	492	490	490	491	490	490
Sum of Projected Surface Water Supplies (acre-feet)				**1,868**	**1,882**	**1,859**	**1,833**	**1,799**	**1,764**

HAYS COUNTY

40.47% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	COLORADO RUN-OF-RIVER	188	827	1,304	2,063	3,025	4,357
K	BUDA	COLORADO	CANYON LAKE/RESERVOIR	1,381	1,292	1,181	1,041	882	701
K	DEER CREEK RANCH WATER	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	125	125	125	125	125	125
K	DRIPPING SPRINGS WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,632	1,632	1,632	1,632	1,632	1,632
K	HAYS COUNTY WCID 1	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	821	808	801	798	717	717

Projected Surface Water Supplies

TWDB 2022 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	HAYS COUNTY WCID 2	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	580	593	600	603	684	684
K	LIVESTOCK, HAYS	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	89	89	89	89	89	89
K	STEAM ELECTRIC POWER, HAYS	COLORADO	CANYON LAKE/RESERVOIR	562	562	562	562	562	562
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	4,349	4,349	4,349	4,349	4,349	4,349
L	BUDA	GUADALUPE	CANYON LAKE/RESERVOIR	299	388	499	639	798	979
L	COUNTY LINE SUD	GUADALUPE	CANYON LAKE/RESERVOIR	905	905	937	968	1,002	1,038
L	COUNTY-OTHER, HAYS	GUADALUPE	CANYON LAKE/RESERVOIR	287	0	373	620	1,619	1,622
L	CRYSTAL CLEAR WSC	GUADALUPE	CANYON LAKE/RESERVOIR	323	317	319	329	340	354
L	GOFORTH SUD	GUADALUPE	CANYON LAKE/RESERVOIR	4,186	4,186	4,186	4,186	4,186	4,186
L	IRRIGATION, HAYS	GUADALUPE	GUADALUPE RUN-OF-RIVER	8	8	8	8	8	8
L	KYLE	GUADALUPE	CANYON LAKE/RESERVOIR	5,443	5,443	5,443	5,443	5,443	5,443
L	LIVESTOCK, HAYS	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	305	305	305	305	305	305
L	MAXWELL WSC	GUADALUPE	CANYON LAKE/RESERVOIR	194	178	168	164	161	161
L	MAXWELL WSC	GUADALUPE	GUADALUPE RUN-OF-RIVER	3	2	2	2	2	2
L	SAN MARCOS	GUADALUPE	CANYON LAKE/RESERVOIR	9,998	9,998	9,998	9,997	9,997	9,997
Sum of Projected Surface Water Supplies (acre-feet)				**31,678**	**32,007**	**32,881**	**33,923**	**35,926**	**37,311**

TRAVIS COUNTY

11.47% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	COLORADO RUN-OF-RIVER	165,981	160,981	170,904	167,135	163,267	158,745
K	AUSTIN	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	123,607	123,607	123,607	123,607	123,607	123,607

Projected Surface Water Supplies

TWDB 2022 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	BARTON CREEK WEST WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	440	440	440	440	440	440
K	BARTON CREEK WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	307	307	307	307	307	307
K	BRIARCLIFF	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	400	400	400	400	400	400
K	CEDAR PARK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,638	1,574	1,822	1,888	1,887	1,887
K	COUNTY-OTHER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	820	820	820	820	820	820
K	CREEDMOOR-MAHA WSC	COLORADO	COLORADO RUN-OF-RIVER	839	839	0	0	0	0
K	CYPRESS RANCH WCID 1	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1	1	1	1	1	1
K	DEER CREEK RANCH WATER	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	125	125	125	125	125	125
K	HURST CREEK MUD	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,600	1,600	1,600	1,600	1,600	1,600
K	IRRIGATION, TRAVIS	COLORADO	COLORADO OTHER LOCAL SUPPLY	87	87	87	87	87	87
K	IRRIGATION, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	461	461	461	461	461	461
K	JONESTOWN WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	750	750	750	750	750	750
K	LAGO VISTA	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,451	3,451	3,451	3,451	3,451	3,451
K	LAKEWAY MUD	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,069	3,069	3,069	3,069	3,069	3,069
K	LEANDER	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,202	1,684	1,738	1,269	1,079	941
K	LIVESTOCK, TRAVIS	COLORADO	COLORADO LIVESTOCK LOCAL SUPPLY	53	53	53	53	53	53
K	LIVESTOCK, TRAVIS	GUADALUPE	GUADALUPE LIVESTOCK LOCAL SUPPLY	2	2	2	2	2	2
K	LOOP 360 WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,250	1,250	1,250	1,250	1,250	1,250

Projected Surface Water Supplies

TWDB 2022 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	MANOR	COLORADO	COLORADO RUN-OF-RIVER	1,680	1,680	0	0	0	0
K	MANUFACTURING, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	1,209	1,368	1,401	1,454	1,454	1,454
K	MANUFACTURING, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	9	9	9	9	9	9
K	MANVILLE WSC	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,929	1,932	1,930	1,927	1,920	1,910
K	MINING, TRAVIS	COLORADO	COLORADO OTHER LOCAL SUPPLY	256	325	399	468	545	632
K	MINING, TRAVIS	GUADALUPE	COLORADO OTHER LOCAL SUPPLY	4	5	6	6	7	8
K	NORTH AUSTIN MUD 1	COLORADO	COLORADO RUN-OF-RIVER	81	78	0	0	0	0
K	NORTHTOWN MUD	COLORADO	COLORADO RUN-OF-RIVER	728	841	0	0	0	0
K	OAK SHORES WATER SYSTEM	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	203	203	203	203	203	203
K	PFLUGERVILLE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	9,513	9,498	9,479	9,458	9,435	9,410
K	ROLLINGWOOD	COLORADO	COLORADO RUN-OF-RIVER	1,120	1,120	0	0	0	0
K	ROUGH HOLLOW IN TRAVIS COUNTY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,795	1,795	1,795	1,795	1,795	1,795
K	ROUND ROCK	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	278	315	352	395	434	470
K	SENNA HILLS MUD	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	404	404	404	404	404	404
K	SHADY HOLLOW MUD	COLORADO	COLORADO RUN-OF-RIVER	793	775	759	750	749	749
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	COLORADO RUN-OF-RIVER	1,060	1,060	1,060	1,060	1,060	1,060
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	591	591	591	591	591	591
K	SUNSET VALLEY	COLORADO	COLORADO RUN-OF-RIVER	716	716	0	0	0	0
K	SWEETWATER COMMUNITY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,514	1,514	1,514	1,514	1,514	1,514
K	TRAVIS COUNTY MUD 10	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	96	96	96	96	96	96

Projected Surface Water Supplies

TWDB 2022 State Water Plan Data

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
K	TRAVIS COUNTY MUD 4	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	3,560	3,562	3,564	3,565	3,565	3,565
K	TRAVIS COUNTY WCID 10	COLORADO	COLORADO RUN-OF-RIVER	3,360	3,360	0	0	0	0
K	TRAVIS COUNTY WCID 17	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	8,800	8,800	8,800	8,800	8,800	8,800
K	TRAVIS COUNTY WCID 18	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,400	1,400	1,400	1,400	1,400	1,400
K	TRAVIS COUNTY WCID 19	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	449	447	445	444	444	444
K	TRAVIS COUNTY WCID 20	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	1,135	1,135	1,135	1,135	1,135	1,135
K	TRAVIS COUNTY WCID POINT VENTURE	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	285	285	285	285	285	285
K	WELLS BRANCH MUD	COLORADO	COLORADO RUN-OF-RIVER	1,397	1,352	0	0	0	0
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	4,500	4,500	4,500	4,500	4,500	4,500
K	WILLIAMSON TRAVIS COUNTIES MUD 1	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	201	201	201	202	201	202
K	WINDERMERE UTILITY	COLORADO	COLORADO RUN-OF-RIVER	2,240	2,240	0	0	0	0
K	WINDERMERE UTILITY	COLORADO	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM	307	307	307	307	307	307
Sum of Projected Surface Water Supplies (acre-feet)				**357,696**	**353,415**	**351,522**	**347,483**	**343,509**	**338,939**

Projected Water Demands TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

CALDWELL COUNTY

4.54% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	AQUA WSC	COLORADO	43	51	59	68	77	86
L	AQUA WSC	GUADALUPE	241	288	336	384	434	483
L	COUNTY LINE SUD	GUADALUPE	226	318	384	436	468	480
L	COUNTY-OTHER, CALDWELL	COLORADO	1	1	1	1	1	1
L	COUNTY-OTHER, CALDWELL	GUADALUPE	5	3	3	3	4	4
L	CREEDMOOR-MAHA WSC	COLORADO	167	186	207	231	257	283
L	CREEDMOOR-MAHA WSC	GUADALUPE	15	17	18	21	23	25
L	GOFORTH SUD	GUADALUPE	45	43	43	43	42	42
L	GONZALES COUNTY WSC	GUADALUPE	54	65	76	87	98	110
L	IRRIGATION, CALDWELL	COLORADO	1	1	1	1	1	1
L	IRRIGATION, CALDWELL	GUADALUPE	35	35	35	35	35	35
L	LIVESTOCK, CALDWELL	COLORADO	3	3	3	3	3	3
L	LIVESTOCK, CALDWELL	GUADALUPE	33	33	33	33	33	33
L	LOCKHART	GUADALUPE	2,258	2,683	3,114	3,557	4,021	4,477
L	LULING	GUADALUPE	956	1,131	1,309	1,493	1,688	1,879
L	MANUFACTURING, CALDWELL	GUADALUPE	0	0	0	0	0	0
L	MARTINDALE WSC	GUADALUPE	361	453	529	626	747	894
L	MAXWELL WSC	GUADALUPE	428	503	579	659	745	829
L	MINING, CALDWELL	COLORADO	0	0	0	0	0	0
L	MINING, CALDWELL	GUADALUPE	5	4	3	2	1	0
L	POLONIA WSC	COLORADO	285	338	391	447	505	562
L	POLONIA WSC	GUADALUPE	605	717	831	948	1,071	1,193
L	SAN MARCOS	GUADALUPE	1	2	3	4	5	6
L	TRI COMMUNITY WSC	GUADALUPE	174	206	239	272	308	343
Sum of Projected Water Demands (acre-feet)			**5,942**	**7,081**	**8,197**	**9,354**	**10,567**	**11,769**

HAYS COUNTY

40.47% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	188	827	1,304	2,063	3,025	4,357
K	BUDA	COLORADO	1,768	2,508	3,419	4,563	5,860	7,338
K	CIMARRON PARK WATER	COLORADO	244	236	230	226	225	225

Projected Water Demands TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	COUNTY-OTHER, HAYS	COLORADO	547	420	628	781	909	1,262
K	DEER CREEK RANCH WATER	COLORADO	26	29	33	35	38	41
K	DRIPPING SPRINGS WSC	COLORADO	1,930	3,190	4,103	5,278	6,716	7,476
K	GOFORTH SUD	COLORADO	153	196	249	317	395	484
K	HAYS	COLORADO	183	235	294	348	435	533
K	HAYS COUNTY WCID 1	COLORADO	821	808	801	798	797	797
K	HAYS COUNTY WCID 2	COLORADO	285	369	464	551	688	844
K	IRRIGATION, HAYS	COLORADO	212	212	212	212	212	212
K	LIVESTOCK, HAYS	COLORADO	7	7	7	7	7	7
K	MANUFACTURING, HAYS	COLORADO	112	131	131	131	131	131
K	MINING, HAYS	COLORADO	342	435	551	585	669	766
K	STEAM ELECTRIC POWER, HAYS	COLORADO	480	480	480	480	480	480
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	4,499	5,590	6,273	7,711	9,151	10,593
L	BUDA	GUADALUPE	298	388	499	639	797	978
L	COUNTY LINE SUD	GUADALUPE	508	714	971	1,241	1,532	1,842
L	COUNTY-OTHER, HAYS	GUADALUPE	529	200	615	863	2,683	4,786
L	CREEDMOOR-MAHA WSC	GUADALUPE	7	8	9	10	11	12
L	CRYSTAL CLEAR WSC	GUADALUPE	632	716	827	973	1,143	1,338
L	GOFORTH SUD	GUADALUPE	2,605	3,871	5,136	6,415	7,712	9,015
L	IRRIGATION, HAYS	GUADALUPE	64	64	64	64	64	64
L	KYLE	GUADALUPE	4,898	7,680	9,133	9,118	9,108	9,104
L	LIVESTOCK, HAYS	GUADALUPE	1,130	1,130	1,130	1,130	1,130	1,130
L	MANUFACTURING, HAYS	GUADALUPE	19	23	23	23	23	23
L	MAXWELL WSC	GUADALUPE	120	126	135	149	165	184
L	SAN MARCOS	GUADALUPE	10,901	12,713	14,968	17,746	21,136	25,193
L	SOUTH BUDA WCID 1	GUADALUPE	214	275	345	409	510	626
L	TEXAS STATE UNIVERSITY	GUADALUPE	928	911	902	898	897	896
L	WIMBERLEY WSC	GUADALUPE	1,015	1,399	1,889	2,503	3,197	3,988
Sum of Projected Water Demands (acre-feet)			**35,665**	**45,891**	**55,825**	**66,267**	**79,846**	**94,725**

TRAVIS COUNTY

11.47% (multiplier)

All values are in acre-feet

Projected Water Demands TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	1,088	1,226	1,362	1,524	1,671	1,809
K	AUSTIN	COLORADO	170,686	198,992	230,751	252,570	269,954	293,513
K	BARTON CREEK WEST WSC	COLORADO	436	433	430	428	427	427
K	BARTON CREEK WSC	COLORADO	524	619	709	776	830	893
K	BRIARCLIFF	COLORADO	300	340	380	425	466	504
K	CEDAR PARK	COLORADO	2,251	2,387	2,554	2,550	2,547	2,546
K	COTTONWOOD CREEK MUD 1	COLORADO	95	107	120	129	138	148
K	COUNTY-OTHER, TRAVIS	COLORADO	135	134	133	133	132	132
K	COUNTY-OTHER, TRAVIS	GUADALUPE	1	1	1	1	1	1
K	CREEDMOOR-MAHA WSC	COLORADO	602	662	721	797	872	944
K	CREEDMOOR-MAHA WSC	GUADALUPE	39	42	46	51	56	60
K	CYPRESS RANCH WCID 1	COLORADO	121	134	144	153	164	163
K	DEER CREEK RANCH WATER	COLORADO	43	49	55	59	63	68
K	ELGIN	COLORADO	255	357	453	563	662	754
K	GARFIELD WSC	COLORADO	199	230	259	281	301	323
K	GOFORTH SUD	GUADALUPE	10	12	16	20	25	31
K	HORNSBY BEND UTILITY	COLORADO	594	678	761	823	879	944
K	HURST CREEK MUD	COLORADO	1,718	1,709	1,703	1,700	1,699	1,699
K	IRRIGATION, TRAVIS	COLORADO	552	552	552	552	552	552
K	JONESTOWN WSC	COLORADO	675	709	744	787	828	866
K	KELLY LANE WCID 1	COLORADO	322	317	313	312	311	311
K	LAGO VISTA	COLORADO	1,868	2,184	2,487	2,832	3,140	3,428
K	LAKEWAY MUD	COLORADO	2,757	2,882	3,019	3,166	3,212	3,211
K	LEANDER	COLORADO	1,519	3,550	3,747	3,953	4,046	4,222
K	LIVESTOCK, TRAVIS	COLORADO	58	58	58	58	58	58
K	LIVESTOCK, TRAVIS	GUADALUPE	2	2	2	2	2	2
K	LOOP 360 WSC	COLORADO	1,225	1,268	1,318	1,363	1,407	1,486
K	MANOR	COLORADO	1,110	1,517	1,907	2,346	2,736	3,099
K	MANUFACTURING, TRAVIS	COLORADO	1,510	1,704	1,704	1,704	1,704	1,704
K	MANVILLE WSC	COLORADO	2,439	2,946	3,435	3,994	4,496	4,966
K	MINING, TRAVIS	COLORADO	398	466	541	610	687	774
K	MINING, TRAVIS	GUADALUPE	4	5	6	6	7	8
K	NORTH AUSTIN MUD 1	COLORADO	81	78	76	75	75	75
K	NORTHTOWN MUD	COLORADO	728	841	947	1,066	1,171	1,268
K	OAK SHORES WATER SYSTEM	COLORADO	150	171	170	169	169	169

Projected Water Demands TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	PFLUGERVILLE	COLORADO	10,403	12,819	15,598	18,364	21,167	21,156
K	ROLLINGWOOD	COLORADO	383	379	375	374	375	377
K	ROUGH HOLLOW IN TRAVIS COUNTY	COLORADO	589	1,213	1,213	1,213	1,213	1,213
K	ROUND ROCK	COLORADO	278	315	352	395	434	470
K	SENNA HILLS MUD	COLORADO	420	493	564	616	659	708
K	SHADY HOLLOW MUD	COLORADO	793	775	759	750	749	749
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	1,176	1,176	1,176	1,176	1,176	1,176
K	SUNSET VALLEY	COLORADO	368	417	483	559	649	753
K	SWEETWATER COMMUNITY	COLORADO	408	862	862	862	862	862
K	TRAVIS COUNTY MUD 10	COLORADO	74	87	99	108	115	124
K	TRAVIS COUNTY MUD 14	COLORADO	172	196	220	238	254	273
K	TRAVIS COUNTY MUD 2	COLORADO	322	372	421	457	489	525
K	TRAVIS COUNTY MUD 4	COLORADO	1,500	1,728	1,945	2,188	2,402	2,603
K	TRAVIS COUNTY WCID 10	COLORADO	3,499	3,802	4,094	4,433	4,739	5,026
K	TRAVIS COUNTY WCID 17	COLORADO	9,370	10,053	11,016	11,186	11,479	11,841
K	TRAVIS COUNTY WCID 18	COLORADO	1,070	1,207	1,341	1,499	1,643	1,779
K	TRAVIS COUNTY WCID 19	COLORADO	449	447	445	444	444	444
K	TRAVIS COUNTY WCID 20	COLORADO	584	581	579	577	577	577
K	TRAVIS COUNTY WCID POINT VENTURE	COLORADO	255	322	378	456	545	624
K	WELLS BRANCH MUD	COLORADO	1,397	1,352	1,321	1,303	1,298	1,297
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	6,698	7,357	7,925	8,824	9,398	9,914
K	WILLIAMSON COUNTY WSID 3	COLORADO	120	147	145	144	144	144
K	WILLIAMSON TRAVIS COUNTIES MUD 1	COLORADO	145	141	139	139	138	138
K	WINDERMERE UTILITY	COLORADO	2,920	2,864	2,831	2,815	2,810	2,809
Sum of Projected Water Demands (acre-feet)			**237,888**	**276,467**	**315,905**	**345,098**	**369,247**	**396,740**

Projected Water Supply Needs TWDB 2022
State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

CALDWELL COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	AQUA WSC	COLORADO	51	43	35	26	17	8
L	AQUA WSC	GUADALUPE	290	243	195	147	97	48
L	COUNTY LINE SUD	GUADALUPE	227	135	33	-54	-124	-177
L	COUNTY-OTHER, CALDWELL	COLORADO	203	216	215	214	211	207
L	COUNTY-OTHER, CALDWELL	GUADALUPE	1,112	1,170	1,165	1,162	1,145	1,131
L	CREEDMOOR-MAHA WSC	COLORADO	0	0	0	0	0	0
L	CREEDMOOR-MAHA WSC	GUADALUPE	0	0	0	0	0	0
L	GOFORTH SUD	GUADALUPE	-16	-23	-27	-25	-20	-18
L	GONZALES COUNTY WSC	GUADALUPE	32	31	28	24	16	9
L	IRRIGATION, CALDWELL	COLORADO	0	0	0	0	0	0
L	IRRIGATION, CALDWELL	GUADALUPE	0	0	0	0	0	0
L	LIVESTOCK, CALDWELL	COLORADO	0	0	0	0	0	0
L	LIVESTOCK, CALDWELL	GUADALUPE	0	0	0	0	0	0
L	LOCKHART	GUADALUPE	817	392	-39	-482	-946	-1,402
L	LULING	GUADALUPE	127	-49	-226	-411	-606	-796
L	MANUFACTURING, CALDWELL	GUADALUPE	0	0	0	0	0	0
L	MARTINDALE WSC	GUADALUPE	-124	-218	-296	-395	-518	-665
L	MAXWELL WSC	GUADALUPE	445	391	328	253	170	86
L	MINING, CALDWELL	COLORADO	3	2	2	1	1	0
L	MINING, CALDWELL	GUADALUPE	0	0	0	0	0	0
L	POLONIA WSC	COLORADO	508	455	398	340	276	213
L	POLONIA WSC	GUADALUPE	1,078	963	846	720	587	451
L	SAN MARCOS	GUADALUPE	1	0	0	0	-1	-2
L	TRI COMMUNITY WSC	GUADALUPE	318	284	251	219	182	147
Sum of Projected Water Supply Needs (acre-feet)			**-140**	**-290**	**-588**	**-1,367**	**-2,215**	**-3,060**

HAYS COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	0	0	0	0	0	0
K	BUDA	COLORADO	1,411	582	-440	-1,724	-3,180	-4,839
K	CIMARRON PARK WATER	COLORADO	47	55	61	65	66	66
K	COUNTY-OTHER, HAYS	COLORADO	966	1,279	764	388	72	-801

Projected Water Supply Needs TWDB 2022
State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	DEER CREEK RANCH WATER	COLORADO	99	96	92	90	87	84
K	DRIPPING SPRINGS WSC	COLORADO	727	-533	-1,446	-2,621	-4,059	-4,819
K	GOFORTH SUD	COLORADO	-60	-113	-168	-232	-308	-393
K	HAYS	COLORADO	0	-55	-114	-168	-255	-353
K	HAYS COUNTY WCID 1	COLORADO	0	0	0	0	-80	-80
K	HAYS COUNTY WCID 2	COLORADO	295	224	136	52	-4	-160
K	IRRIGATION, HAYS	COLORADO	257	257	257	257	257	257
K	LIVESTOCK, HAYS	COLORADO	903	903	903	903	903	903
K	MANUFACTURING, HAYS	COLORADO	191	144	144	144	144	144
K	MINING, HAYS	COLORADO	-531	-761	-1,047	-1,131	-1,340	-1,579
K	STEAM ELECTRIC POWER, HAYS	COLORADO	511	511	511	511	511	511
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	128	-963	-1,646	-3,084	-4,524	-5,966
L	BUDA	GUADALUPE	1	0	0	0	1	1
L	COUNTY LINE SUD	GUADALUPE	509	303	82	-153	-406	-675
L	COUNTY-OTHER, HAYS	GUADALUPE	0	106	0	0	-2,029	-7,220
L	CREEDMOOR-MAHA WSC	GUADALUPE	0	0	0	0	0	0
L	CRYSTAL CLEAR WSC	GUADALUPE	-35	61	-45	-168	-310	-472
L	GOFORTH SUD	GUADALUPE	3,175	1,928	669	-608	-1,906	-3,212
L	IRRIGATION, HAYS	GUADALUPE	349	349	349	349	349	349
L	KYLE	GUADALUPE	1,375	-1,407	-2,860	-2,845	-2,835	-2,831
L	LIVESTOCK, HAYS	GUADALUPE	0	0	0	0	0	0
L	MANUFACTURING, HAYS	GUADALUPE	502	494	494	494	494	494
L	MAXWELL WSC	GUADALUPE	125	98	76	57	38	19
L	SAN MARCOS	GUADALUPE	2,181	369	-1,887	-4,666	-8,056	-12,113
L	SOUTH BUDA WCID 1	GUADALUPE	436	375	305	241	140	24
L	TEXAS STATE UNIVERSITY	GUADALUPE	202	219	228	232	233	234
L	WIMBERLEY WSC	GUADALUPE	137	-247	-737	-1,351	-2,045	-2,836
Sum of Projected Water Supply Needs (acre-feet)			**-626**	**-4,079**	**-10,390**	**-18,751**	**-31,337**	**-48,349**

TRAVIS COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AQUA WSC	COLORADO	0	0	0	0	0	0

Projected Water Supply Needs TWDB 2022
State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	AUSTIN	COLORADO	121,593	87,987	66,151	40,563	19,311	-8,770
K	BARTON CREEK WEST WSC	COLORADO	4	7	10	12	13	13
K	BARTON CREEK WSC	COLORADO	-217	-312	-402	-469	-523	-586
K	BRIARCLIFF	COLORADO	100	60	20	-25	-66	-104
K	CEDAR PARK	COLORADO	-613	-813	-732	-662	-660	-659
K	COTTONWOOD CREEK MUD 1	COLORADO	0	0	0	0	0	0
K	COUNTY-OTHER, TRAVIS	COLORADO	10,722	10,719	10,710	10,705	10,702	10,694
K	COUNTY-OTHER, TRAVIS	GUADALUPE	101	101	102	102	102	102
K	CREEDMOOR-MAHA WSC	COLORADO	555	473	-448	-552	-656	-757
K	CREEDMOOR-MAHA WSC	GUADALUPE	21	18	14	9	4	0
K	CYPRESS RANCH WCID 1	COLORADO	102	89	79	70	59	60
K	DEER CREEK RANCH WATER	COLORADO	82	76	70	66	62	57
K	ELGIN	COLORADO	0	0	0	0	0	0
K	GARFIELD WSC	COLORADO	61	30	1	-21	-41	-63
K	GOFORTH SUD	GUADALUPE	-4	-6	-10	-15	-20	-26
K	HORNSBY BEND UTILITY	COLORADO	350	266	183	121	65	0
K	HURST CREEK MUD	COLORADO	-12	-3	3	6	7	7
K	IRRIGATION, TRAVIS	COLORADO	908	908	908	908	908	908
K	JONESTOWN WSC	COLORADO	75	41	6	-37	-78	-116
K	KELLY LANE WCID 1	COLORADO	66	71	75	76	77	77
K	LAGO VISTA	COLORADO	1,998	1,682	1,379	1,034	726	438
K	LAKEWAY MUD	COLORADO	312	187	50	-97	-143	-142
K	LEANDER	COLORADO	-317	-1,866	-2,009	-2,684	-2,967	-3,281
K	LIVESTOCK, TRAVIS	COLORADO	0	0	0	0	0	0
K	LIVESTOCK, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	LOOP 360 WSC	COLORADO	25	-18	-68	-113	-157	-236
K	MANOR	COLORADO	2,210	1,903	325	219	310	10
K	MANUFACTURING, TRAVIS	COLORADO	0	0	286	742	742	742
K	MANVILLE WSC	COLORADO	2,033	1,608	1,135	577	-476	-1,696
K	MINING, TRAVIS	COLORADO	0	0	0	0	0	0
K	MINING, TRAVIS	GUADALUPE	0	0	0	0	0	0
K	NORTH AUSTIN MUD 1	COLORADO	0	0	-76	-75	-75	-75
K	NORTHTOWN MUD	COLORADO	0	0	-947	-1,066	-1,171	-1,268
K	OAK SHORES WATER SYSTEM	COLORADO	135	114	115	116	116	116
K	PFLUGERVILLE	COLORADO	1,641	-790	-3,589	-6,376	-9,203	-9,220
K	ROLLINGWOOD	COLORADO	737	741	-375	-374	-375	-377

Projected Water Supply Needs TWDB 2022
State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
K	ROUGH HOLLOW IN TRAVIS COUNTY	COLORADO	1,206	582	582	582	582	582
K	ROUND ROCK	COLORADO	0	0	0	0	0	0
K	SENNA HILLS MUD	COLORADO	-16	-89	-160	-212	-255	-304
K	SHADY HOLLOW MUD	COLORADO	0	0	0	0	0	0
K	STEAM ELECTRIC POWER, TRAVIS	COLORADO	4,140	4,140	4,140	4,140	4,140	4,140
K	SUNSET VALLEY	COLORADO	388	339	-443	-519	-609	-713
K	SWEETWATER COMMUNITY	COLORADO	1,106	652	652	652	652	652
K	TRAVIS COUNTY MUD 10	COLORADO	22	9	-3	-12	-19	-28
K	TRAVIS COUNTY MUD 14	COLORADO	52	28	4	-14	-30	-49
K	TRAVIS COUNTY MUD 2	COLORADO	218	168	119	83	51	15
K	TRAVIS COUNTY MUD 4	COLORADO	2,060	1,834	1,619	1,377	1,163	962
K	TRAVIS COUNTY WCID 10	COLORADO	-139	-442	-4,094	-4,433	-4,739	-5,026
K	TRAVIS COUNTY WCID 17	COLORADO	635	-48	-1,011	-1,181	-1,474	-1,836
K	TRAVIS COUNTY WCID 18	COLORADO	330	193	59	-99	-243	-379
K	TRAVIS COUNTY WCID 19	COLORADO	0	0	0	0	0	0
K	TRAVIS COUNTY WCID 20	COLORADO	551	554	556	558	558	558
K	TRAVIS COUNTY WCID POINT VENTURE	COLORADO	30	-37	-93	-171	-260	-339
K	WELLS BRANCH MUD	COLORADO	0	0	-1,321	-1,303	-1,298	-1,297
K	WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	COLORADO	-1,784	-2,443	-3,011	-3,910	-4,484	-5,000
K	WILLIAMSON COUNTY WSID 3	COLORADO	20	18	13	9	4	0
K	WILLIAMSON TRAVIS COUNTIES MUD 1	COLORADO	56	60	62	63	63	64
K	WINDERMERE UTILITY	COLORADO	689	745	-1,462	-1,446	-1,441	-1,440
Sum of Projected Water Supply Needs (acre-feet)			**-3,102**	**-6,867**	**-20,254**	**-25,866**	**-31,463**	**-43,787**

CALDWELL COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
AQUA WSC, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	1	1	1
		0	**0**	**0**	**1**	**1**	**1**
COUNTY LINE SUD, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	190	174	157	138
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	42	37
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	148	148	135	124	112	99
COUNTY LINE SUD - BRACKISH EDWARDS WELLFIELD	EDWARDS-BFZ AQUIFER [HAYS]	0	0	0	130	234	310
COUNTY LINE SUD - TRINITY WELLFIELD	TRINITY AQUIFER [HAYS]	0	0	0	130	173	153
REUSE - COUNTY LINE SUD	DIRECT REUSE [HAYS]	172	345	476	582	655	695
		320	**493**	**801**	**1,140**	**1,373**	**1,432**
GOFORTH SUD, GUADALUPE (L)							
DROUGHT MANAGEMENT – GOFORTH SUD	DEMAND REDUCTION [CALDWELL]	2	0	0	0	0	0
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	32	20	15	12	10	9
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [GONZALES]	32	21	16	13	10	9
		66	**41**	**31**	**25**	**20**	**18**
GONZALES COUNTY WSC, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	3	9	16	24	34	45
		3	**9**	**16**	**24**	**34**	**45**
LOCKHART, GUADALUPE (L)							
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	1,489	1,489	1,489	1,489	1,489	1,489
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [GONZALES]	1,511	1,511	1,511	1,511	1,511	1,511
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	0	0	71
		3,000	**3,000**	**3,000**	**3,000**	**3,000**	**3,071**
LULING, GUADALUPE (L)							
LOCAL CARRIZO AQUIFER DEVELOPMENT	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	349	350	702	702	1,056

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	0	0	2
		0	**349**	**350**	**702**	**702**	**1,058**
MARTINDALE WSC, GUADALUPE (L)							
CRWA - WELLS RANCH (PHASE 3)	CARRIZO-WILCOX AQUIFER [GUADALUPE]	0	61	131	231	484	779
DROUGHT MANAGEMENT - MARTINDALE	DEMAND REDUCTION [CALDWELL]	20	0	0	0	0	0
FE - CRWA HAYS CALDWELL WTP EXPANSION	GUADALUPE RUN-OF-RIVER [HAYS]	242	241	238	235	233	233
MARTINDALE WSC - ALLUVIAL WELL	SAN MARCOS RIVER ALLUVIUM AQUIFER [CALDWELL]	0	226	224	222	219	219
		262	**528**	**593**	**688**	**936**	**1,231**
MAXWELL WSC, GUADALUPE (L)							
MAXWELL WSC - TRINITY WELL FIELD	TRINITY AQUIFER [HAYS]	0	0	187	188	188	188
		0	**0**	**187**	**188**	**188**	**188**
POLONIA WSC, COLORADO (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	0	0	1
		0	**0**	**0**	**0**	**0**	**1**
POLONIA WSC, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	0	0	3
		0	**0**	**0**	**0**	**0**	**3**
SAN MARCOS, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	2	2	2	2
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	1	1
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	1	1	1	1	1
FE - CRWA HAYS CALDWELL WTP EXPANSION	DIRECT REUSE [HAYS]	0	0	0	0	0	0
REUSE - SAN MARCOS (NON-POTABLE)	DIRECT REUSE [HAYS]	0	0	0	0	0	0
REUSE - SAN MARCOS (POTABLE)	DIRECT REUSE [HAYS]	0	0	0	1	1	1
		0	**1**	**3**	**4**	**5**	**5**

WUG, Basin (RWPG) | All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
TRI COMMUNITY WSC, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [CALDWELL]	0	0	0	0	0	2
		0	**0**	**0**	**0**	**0**	**2**
Sum of Projected Water Management Strategies (acre-feet)		**3,651**	**4,421**	**4,981**	**5,772**	**6,259**	**7,055**

HAYS COUNTY

WUG, Basin (RWPG) | All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
AUSTIN, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	9	38	59	94	137	198
		9	**38**	**59**	**94**	**137**	**198**
BUDA, COLORADO (K)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	1,067	1,067	1,067	1,067
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	157	157
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	762	762	762	762	762	762
DIRECT POTABLE REUSE - BUDA	DIRECT REUSE [HAYS]	0	2,240	2,240	2,240	2,240	2,240
DIRECT REUSE - BUDA	DIRECT REUSE [HAYS]	0	920	520	520	880	680
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	322	443	607	813	1,045	1,309
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	150	600	600	600	600	600
MUNICIPAL CONSERVATION - BUDA	DEMAND REDUCTION [HAYS]	159	292	382	499	636	793
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	11	42	61	90	126	172
SALINE EDWARDS DESALINATION AND ASR (STORAGE)	EDWARDS-BFZ AQUIFER (SALINE PORTION) ASR [TRAVIS]	0	0	800	800	800	800
		1,404	**5,299**	**7,039**	**7,391**	**8,313**	**8,580**
CIMARRON PARK WATER, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	18	12	12	11	11	11
		18	**12**	**12**	**11**	**11**	**11**

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
COUNTY-OTHER, HAYS, COLORADO (K)						
BRUSH MANAGEMENT	TRINITY AQUIFER [HAYS]	83	83	83	83	83
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	103	132	155	176	243
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	289	289	289	289	289
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [HAYS]	0	0	0	0	200
GBRA - MBWSP - SURFACE WATER W/ ASR	CARRIZO-WILCOX AQUIFER ASR [GONZALES]	1,000	1,000	1,000	1,000	1,000
RAINWATER HARVESTING - HAYS COUNTY-OTHER	RAINWATER HARVESTING [HAYS]	16	24	31	36	50
SALINE EDWARDS DESALINATION AND ASR (STORAGE)	EDWARDS-BFZ AQUIFER (SALINE PORTION) ASR [TRAVIS]	0	500	500	500	500
		1,491	**2,028**	**2,058**	**2,084**	**2,365**
DEER CREEK RANCH WATER, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	1	2	2	2	2
		1	**2**	**2**	**2**	**2**
DRIPPING SPRINGS WSC, COLORADO (K)						
DIRECT POTABLE REUSE - DRIPPING SPRINGS WSC	DIRECT REUSE [HAYS]	560	560	560	560	560
DIRECT REUSE - DRIPPING SPRINGS WSC	DIRECT REUSE [HAYS]	390	460	531	601	672
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	580	753	972	1,239	1,380
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [HAYS]	0	300	300	300	300
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	0	1,000	2,000	2,000
MUNICIPAL CONSERVATION - DRIPPING SPRINGS WSC	DEMAND REDUCTION [HAYS]	289	339	417	522	576
RAINWATER HARVESTING - DRIPPING SPRINGS WSC	RAINWATER HARVESTING [HAYS]	34	44	57	73	81
		1,853	**2,456**	**3,837**	**5,295**	**5,569**
GOFORTH SUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	10	12	16	20	24

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
DROUGHT MANAGEMENT – GOFORTH SUD	DEMAND REDUCTION [HAYS]	6	0	0	0	0	0
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	108	95	91	122	191	264
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [GONZALES]	110	96	92	94	97	102
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	0	0	0	3
		232	**201**	**195**	**232**	**308**	**393**
HAYS, COLORADO (K)							
DEVELOPMENT OF NEW GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [HAYS]	0	100	100	100	100	100
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	37	47	59	70	87	107
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	0	146	146	146	146	146
NEW WATER PURCHASE - HAYS	EDWARDS-BFZ AQUIFER [HAYS]	0	0	0	0	70	140
RAINWATER HARVESTING - HAYS	RAINWATER HARVESTING [HAYS]	0	3	4	4	6	7
		37	**296**	**309**	**320**	**409**	**500**
HAYS COUNTY WCID 1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	149	134	121	114	114	114
MUNICIPAL CONSERVATION - HAYS COUNTY WCID 1	DEMAND REDUCTION [HAYS]	74	136	196	226	225	225
		223	**270**	**317**	**340**	**339**	**339**
HAYS COUNTY WCID 2, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	52	61	70	76	95	117
MUNICIPAL CONSERVATION - HAYS COUNTY WCID 2	DEMAND REDUCTION [HAYS]	26	62	114	169	211	259
		78	**123**	**184**	**245**	**306**	**376**
MINING, HAYS, COLORADO (K)							
DIRECT REUSE - BUDA	DIRECT REUSE [HAYS]	0	200	600	600	800	1,000
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [HAYS]	600	600	600	600	600	600
		600	**800**	**1,200**	**1,200**	**1,400**	**1,600**

Projected Water Management Strategies TWDB

2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY, COLORADO (K)							
DIRECT REUSE - WEST TRAVIS COUNTY PUA	DIRECT REUSE [TRAVIS]	0	97	99	104	111	116
DROUGHT MANAGEMENT	DEMAND REDUCTION [HAYS]	819	921	933	1,033	1,104	1,151
GBRA - MBWSP - SURFACE WATER W/ ASR	CARRIZO-WILCOX AQUIFER ASR [GONZALES]	0	3,000	3,000	3,000	3,000	3,000
LCRA - EXCESS FLOWS RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	1,400	1,400	2,500	2,500	3,300
MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DEMAND REDUCTION [HAYS]	405	984	1,610	2,546	3,631	4,840
		1,224	**6,402**	**7,042**	**9,183**	**10,346**	**12,407**
BUDA, GUADALUPE (L)							
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	21	21
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	2	6	9	13	17	23
		2	**6**	**9**	**13**	**38**	**44**
COUNTY LINE SUD, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	479	495	512	531
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	136	141
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	330	330	343	354	366	379
COUNTY LINE SUD - BRACKISH EDWARDS WELLFIELD	EDWARDS-BFZ AQUIFER [HAYS]	0	0	0	370	766	1,190
COUNTY LINE SUD - TRINITY WELLFIELD	TRINITY AQUIFER [HAYS]	0	0	0	370	567	587
REUSE - COUNTY LINE SUD	DIRECT REUSE [HAYS]	388	775	1,204	1,658	2,145	2,665
		718	**1,105**	**2,026**	**3,247**	**4,492**	**5,493**
COUNTY-OTHER, HAYS, GUADALUPE (L)							
GBRA - MBWSP - SURFACE WATER W/ ASR	CARRIZO-WILCOX AQUIFER ASR [GONZALES]	0	0	0	0	2,029	7,220
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	0	0	0	232
		0	**0**	**0**	**0**	**2,029**	**7,452**
CRYSTAL CLEAR WSC, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	929	957	989	1,029
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	263	274

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	671	659	663	683	707	735
DROUGHT MANAGEMENT - CRYSTAL CLEAR WSC	DEMAND REDUCTION [HAYS]	24	0	0	0	0	0
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	0	0	0	22
		695	**659**	**1,592**	**1,640**	**1,959**	**2,060**
GOFORTH SUD, GUADALUPE (L)							
DROUGHT MANAGEMENT – GOFORTH SUD	DEMAND REDUCTION [HAYS]	101	0	0	0	0	0
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	1,837	1,863	1,872	1,842	1,770	1,694
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [GONZALES]	1,866	1,892	1,901	1,902	1,902	1,897
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	0	0	0	50
		3,804	**3,755**	**3,773**	**3,744**	**3,672**	**3,641**
KYLE, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	5,916	5,916	5,916	5,916
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	1,573	1,573
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	4,225	4,225	4,225	4,225	4,225	4,225
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	0	52	266	480
		4,225	**4,225**	**10,141**	**10,193**	**11,980**	**12,194**
MAXWELL WSC, GUADALUPE (L)							
MAXWELL WSC - TRINITY WELL FIELD	TRINITY AQUIFER [HAYS]	0	0	43	42	42	42
		0	**0**	**43**	**42**	**42**	**42**
SAN MARCOS, GUADALUPE (L)							
ARWA - PHASE 2	CARRIZO-WILCOX AQUIFER [CALDWELL]	0	0	7,528	7,528	7,528	7,528
ARWA - PHASE 3	DIRECT REUSE [HAYS]	0	0	0	0	2,001	2,001
ARWA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	2,594	5,379	5,379	5,379	5,379	5,379
FE - CRWA HAYS CALDWELL WTP EXPANSION	DIRECT REUSE [HAYS]	1,288	1,288	1,288	1,288	1,288	1,288
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	0	0	54	395	949	1,706
REUSE - SAN MARCOS (NON-POTABLE)	DIRECT REUSE [HAYS]	1,826	1,971	1,971	1,971	1,971	1,971
REUSE - SAN MARCOS (POTABLE)	DIRECT REUSE [HAYS]	0	0	0	3,807	3,807	3,807

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
		5,708	**8,638**	**16,220**	**20,368**	**22,923**	**23,680**
SOUTH BUDA WCID 1, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	4	6	12	21	38	60
		4	**6**	**12**	**21**	**38**	**60**
TEXAS STATE UNIVERSITY, GUADALUPE (L)							
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [HAYS]	33	101	153	167	185	201
		33	**101**	**153**	**167**	**185**	**201**
WIMBERLEY WSC, GUADALUPE (L)							
GBRA - MBWSP - SURFACE WATER W/ ASR	CARRIZO-WILCOX AQUIFER ASR [GONZALES]	0	262	752	1,366	2,060	2,851
		0	**262**	**752**	**1,366**	**2,060**	**2,851**
Sum of Projected Water Management Strategies (acre-feet)		**19,698**	**35,543**	**55,564**	**65,714**	**78,368**	**90,058**

TRAVIS COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
AQUA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	208	240	270	304	334	362
MUNICIPAL CONSERVATION - AQUA WSC	DEMAND REDUCTION [TRAVIS]	49	26	10	3	0	0
MUNICIPAL WATER CONSERVATION	DEMAND REDUCTION [TRAVIS]	1	1	2	2	3	3
		258	**267**	**282**	**309**	**337**	**365**
AUSTIN, COLORADO (K)							
AUSTIN - AQUIFER STORAGE AND RECOVERY	CARRIZO-WILCOX AQUIFER ASR [BASTROP]	0	0	7,900	10,500	13,200	15,800
AUSTIN - BLACKWATER AND GREYWATER REUSE	DIRECT REUSE [TRAVIS]	0	1,450	3,450	5,400	7,340	9,290
AUSTIN - BRACKISH GROUNDWATER DESALINATION	EDWARDS-BFZ AQUIFER [TRAVIS]	0	0	0	0	0	2,700
AUSTIN - BRACKISH GROUNDWATER DESALINATION	TRINITY AQUIFER [TRAVIS]	0	0	0	0	0	2,300
AUSTIN - CAPTURE LOCAL INFLOWS TO LADY BIRD LAKE	COLORADO RUN-OF-RIVER [TRAVIS]	0	0	3,000	3,000	3,000	3,000

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
AUSTIN - CENTRALIZED DIRECT NON-POTABLE REUSE	DIRECT REUSE [TRAVIS]	2,990	10,250	14,583	18,917	23,250
AUSTIN - COMMUNITY-SCALE STORMWATER HARVESTING	RAINWATER HARVESTING [TRAVIS]	66	158	184	210	236
AUSTIN - CONSERVATION	DEMAND REDUCTION [TRAVIS]	14,890	24,870	30,120	35,370	40,620
AUSTIN - DECENTRALIZED DIRECT NON-POTABLE REUSE	DIRECT REUSE [TRAVIS]	1,400	4,160	8,330	12,510	16,680
AUSTIN - INDIRECT POTABLE REUSE THROUGH LADY BIRD LAKE	INDIRECT REUSE [TRAVIS]	0	11,000	14,000	17,000	20,000
AUSTIN - LAKE AUSTIN OPERATIONS	COLORADO RUN-OF-RIVER [TRAVIS]	1,250	1,250	1,250	1,250	1,250
AUSTIN - LONGHORN DAM OPERATION IMPROVEMENTS	COLORADO RUN-OF-RIVER [TRAVIS]	3,000	3,000	3,000	3,000	3,000
AUSTIN - OFF-CHANNEL RESERVOIR AND EVAPORATION SUPPRESSION	AUSTIN OFF-CHANNEL LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	25,827
AUSTIN - ONSITE RAINWATER AND STORMWATER HARVESTING	RAINWATER HARVESTING [TRAVIS]	790	1,880	2,890	3,890	4,900
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	9,045	10,489	11,480	12,271	13,342
		34,881	**81,407**	**104,737**	**127,958**	**182,195**

BARTON CREEK WEST WSC, COLORADO (K)

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	71	64	58	52	47
MUNICIPAL CONSERVATION - BARTON CREEK WEST WSC	DEMAND REDUCTION [TRAVIS]	76	109	139	167	193
		147	**173**	**197**	**219**	**240**

BARTON CREEK WSC, COLORADO (K)

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	127	131	130	125	121
MUNICIPAL CONSERVATION - BARTON CREEK WSC	DEMAND REDUCTION [TRAVIS]	110	183	258	330	409
WATER PURCHASE AMENDMENT - BARTON CREEK WSC	HIGHLAND LAKES LAKE/RESERVOIR SYSTEM [RESERVOIR]	90	90	90	90	90
		327	**404**	**478**	**545**	**620**

BRIARCLIFF, COLORADO (K)

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	68	76	85	93	106
		68	**76**	**85**	**93**	**106**

Projected Water Management Strategies TWDB
2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
CEDAR PARK, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	410	393	393	393	393	393
MUNICIPAL CONSERVATION - CEDAR PARK	DEMAND REDUCTION [TRAVIS]	203	420	590	586	583	582
		613	**813**	**983**	**979**	**976**	**975**
COTTONWOOD CREEK MUD 1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	5	5	6	6	7	7
		5	**5**	**6**	**6**	**7**	**7**
COUNTY-OTHER, TRAVIS, COLORADO (K)							
BRUSH MANAGEMENT	TRINITY AQUIFER [TRAVIS]	0	83	83	83	83	83
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	230	219	212	204	195	190
MUNICIPAL CONSERVATION - TRAVIS COUNTY-OTHER (AQUA TEXAS - RIVERCREST)	DEMAND REDUCTION [TRAVIS]	29	55	79	102	123	142
		259	**357**	**374**	**389**	**401**	**415**
COUNTY-OTHER, TRAVIS, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2	2	2	2	2	2
		2	**2**	**2**	**2**	**2**	**2**
CREEDMOOR-MAHA WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	29	31	33	36	39	42
EDWARDS / MIDDLE TRINITY ASR	TRINITY AQUIFER ASR [HAYS]	0	289	289	289	289	289
MUNICIPAL CONSERVATION - CREEDMOOR-MAHA WSC	DEMAND REDUCTION [TRAVIS]	30	37	55	86	93	100
WATER PURCHASE AMENDMENT - CREEDMOOR-MAHA WSC	CARRIZO-WILCOX AQUIFER [BASTROP]	0	0	335	335	335	335
		59	**357**	**712**	**746**	**756**	**766**
CREEDMOOR-MAHA WSC, GUADALUPE (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2	2	2	2	2	3
MUNICIPAL CONSERVATION - CREEDMOOR-MAHA WSC	DEMAND REDUCTION [TRAVIS]	2	2	4	6	6	6
		4	**4**	**6**	**8**	**8**	**9**

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
CYPRESS RANCH WCID 1, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	6	7	7	7	7
MUNICIPAL CONSERVATION - CYPRESS RANCH WCID 1	DEMAND REDUCTION [TRAVIS]	9	14	20	21	20
		15	**21**	**27**	**28**	**27**
DEER CREEK RANCH WATER, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2	3	3	3	3
		2	**3**	**3**	**3**	**3**
ELGIN , COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	45	42	32	37	42
MUNICIPAL CONSERVATION - ELGIN	DEMAND REDUCTION [TRAVIS]	25	47	81	94	107
		70	**89**	**113**	**131**	**149**
GARFI ELD WSC, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	12	13	14	15	16
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	7	26	47
		12	**13**	**21**	**41**	**63**
GOFORTH SUD, GUADALUPE (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1	1	1	1	2
DROUGHT MANAGEMENT – GOFORTH SUD	DEMAND REDUCTION [TRAVIS]	0	0	0	0	0
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [CALDWELL]	6	6	8	13	17
GBRA SHARED PROJECT (PHASE 1)	CARRIZO-WILCOX AQUIFER [GONZALES]	6	6	6	6	7
		13	**13**	**15**	**20**	**26**
HORNSBY BEND UTILITY, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	34	38	41	44	47
		34	**38**	**41**	**44**	**47**
HURST CREEK MUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	281	253	228	205	185
MUNICIPAL CONSERVATION - HURST CREEK MUD	DEMAND REDUCTION [TRAVIS]	302	437	560	673	776

Projected Water Management Strategies TWDB 2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
		468	**583**	**690**	**788**	**878**	**961**
JONESTOWN WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	124	132	141	150	158	165
MUNICIPAL CONSERVATION - JONESTOWN WSC	DEMAND REDUCTION [TRAVIS]	56	47	41	39	40	41
		180	**179**	**182**	**189**	**198**	**206**
KELLY LANE WCID 1, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	73	66	66	66	66	66
MUNICIPAL CONSERVATION - KELLY LANE WCID 1	DEMAND REDUCTION [TRAVIS]	29	52	48	47	46	46
		102	**118**	**114**	**113**	**112**	**112**
LAGO VISTA, COLORADO (K)							
DIRECT REUSE - LAGO VISTA	DIRECT REUSE [TRAVIS]	0	224	336	448	560	673
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	340	362	373	384	408	446
MUNICIPAL CONSERVATION - LAGO VISTA	DEMAND REDUCTION [TRAVIS]	168	375	622	914	1,098	1,198
		508	**961**	**1,331**	**1,746**	**2,066**	**2,317**
LAKEWAY MUD, COLORADO (K)							
DIRECT REUSE - LAKEWAY MUD	DIRECT REUSE [TRAVIS]	0	450	450	900	900	900
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	502	478	454	430	409	409
MUNICIPAL CONSERVATION - LAKEWAY MUD	DEMAND REDUCTION [TRAVIS]	248	492	748	1,015	1,169	1,168
		750	**1,420**	**1,652**	**2,345**	**2,478**	**2,477**
LEANDER, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	320	594	616	645	659	686
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	1,400	1,400	2,600	2,600	2,600
		320	**1,994**	**2,016**	**3,245**	**3,259**	**3,286**
LOOP 360 WSC, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	223	209	196	183	170	161
MUNICIPAL CONSERVATION - LOOP 360 WSC	DEMAND REDUCTION [TRAVIS]	110	225	339	450	559	679
		333	**434**	**535**	**633**	**729**	**840**

Projected Water Management Strategies TWDB
2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
MANOR, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	204	249	302	350	395
		204	**249**	**302**	**350**	**395**
MANVILLE WSC, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	589	687	799	899	993
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	0	0	0	703
		589	**687**	**799**	**899**	**1,696**
NORTH AUSTIN MUD 1, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	4	4	4	4	4
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	80	80	80	80
		4	**84**	**84**	**84**	**84**
NORTHTOWN MUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	42	47	53	59	63
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	900	1,100	1,300	1,300
		42	**947**	**1,153**	**1,359**	**1,363**
OAK SHORES WATER SYSTEM, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	28	26	23	21	20
MUNICIPAL CONSERVATION - OAK SHORES WATER SYSTEM	DEMAND REDUCTION [TRAVIS]	29	42	54	65	70
		57	**68**	**77**	**86**	**90**
PFLUGERVILLE, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	3,068	3,748	4,423	5,103	5,103
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - EDWARDS-BFZ AQUIFER	EDWARDS-BFZ AQUIFER [TRAVIS]	0	20	20	20	20
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	0	1,300	3,400	3,400
MUNICIPAL CONSERVATION - PFLUGERVILLE	DEMAND REDUCTION [TRAVIS]	549	606	674	754	743

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
MUNICIPAL WATER CONSERVATION - PFLUGERVILLE	DEMAND REDUCTION [TRAVIS]	598	684	789	888	989
		4,215	**5,058**	**7,206**	**10,165**	**10,255**
ROLLINGWOOD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	63	57	52	47	46
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	250	250	250	250
MUNICIPAL CONSERVATION - ROLLINGWOOD	DEMAND REDUCTION [TRAVIS]	64	90	116	142	148
		127	**397**	**418**	**439**	**444**
ROUGH HOLLOW IN TRAVIS COUNTY, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	199	179	179	179	179
MUNICIPAL CONSERVATION - ROUGH HOLLOW IN TRAVIS COUNTY	DEMAND REDUCTION [TRAVIS]	220	319	319	319	319
		419	**498**	**498**	**498**	**498**
ROUND ROCK, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	79	88	99	109	118
MUNICIPAL CONSERVATION - ROUND ROCK	DEMAND REDUCTION [TRAVIS]	1	0	0	0	0
		80	**88**	**99**	**109**	**118**
SENNA HILLS MUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	84	83	80	77
MUNICIPAL CONSERVATION - SENNA HILLS MUD	DEMAND REDUCTION [TRAVIS]	85	142	200	258	321
		167	**226**	**283**	**338**	**398**
SHADY HOLLOW MUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	137	137	137	137	137
MUNICIPAL CONSERVATION - SHADY HOLLOW MUD	DEMAND REDUCTION [TRAVIS]	90	74	65	64	64
		227	**211**	**202**	**201**	**201**
STEAM ELECTRIC POWER, TRAVIS, COLORADO (K)						
AUSTIN - CENTRALIZED DIRECT NON-POTABLE REUSE	DIRECT REUSE [TRAVIS]	1,750	1,750	1,750	1,750	1,750
		1,750	**1,750**	**1,750**	**1,750**	**1,750**

Projected Water Management Strategies TWDB
2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
SUNSET VALLEY, COLORADO (K)						
DEVELOPMENT OF NEW GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	0	300	300	300	300
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	69	72	75	79	82
EXPANSION OF CURRENT GROUNDWATER SUPPLIES - EDWARDS-BFZ AQUIFER	EDWARDS-BFZ AQUIFER [TRAVIS]	0	50	50	50	50
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	300	300	300	300
MUNICIPAL CONSERVATION - SUNSET VALLEY	DEMAND REDUCTION [TRAVIS]	73	123	183	256	343
RAINWATER HARVESTING - SUNSET VALLEY	RAINWATER HARVESTING [TRAVIS]	2	2	3	3	4
		144	**847**	**911**	**988**	**1,079**
SWEETWATER COMMUNITY, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	172	172	172	172	172
		172	**172**	**172**	**172**	**172**
TRAVIS COUNTY MUD 10, COLORADO (K)						
DEVELOPMENT OF NEW GROUNDWATER SUPPLIES - TRINITY AQUIFER	TRINITY AQUIFER [TRAVIS]	100	100	100	100	100
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	18	19	20	22	23
MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD 10	DEMAND REDUCTION [TRAVIS]	15	25	27	28	30
		133	**144**	**147**	**150**	**153**
TRAVIS COUNTY MUD 14, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	10	11	12	13	14
WATER PURCHASE AMENDMENT - TRAVIS COUNTY MUD 14	CARRIZO-WILCOX AQUIFER [BASTROP]	0	0	35	35	35
		10	**11**	**47**	**48**	**49**
TRAVIS COUNTY MUD 2, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	46	48	49	52	56
		46	**48**	**49**	**52**	**56**

WUG, Basin (RWPG) — All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
TRAVIS COUNTY MUD 4, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	341	355	360	364	360	351
MUNICIPAL CONSERVATION - TRAVIS COUNTY MUD 4	DEMAND REDUCTION [TRAVIS]	135	309	507	731	962	1,198
		476	**664**	**867**	**1,095**	**1,322**	**1,549**
TRAVIS COUNTY WCID 10, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	796	786	766	748	720	688
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	0	2,300	2,300	2,300	2,300
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 10	DEMAND REDUCTION [TRAVIS]	315	660	1,031	1,440	1,858	2,275
		1,111	**1,446**	**4,097**	**4,488**	**4,878**	**5,263**
TRAVIS COUNTY WCID 17, COLORADO (K)							
DIRECT REUSE - TRAVIS COUNTY WCID 17	DIRECT REUSE [TRAVIS]	0	510	510	510	510	510
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	2,132	2,076	2,056	1,882	1,791	1,848
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 17	DEMAND REDUCTION [TRAVIS]	843	1,748	2,794	3,658	4,317	4,451
		2,975	**4,334**	**5,360**	**6,050**	**6,618**	**6,809**
TRAVIS COUNTY WCID 18, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	263	304	342	385	423	458
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 18	DEMAND REDUCTION [TRAVIS]	75	58	47	43	43	46
		338	**362**	**389**	**428**	**466**	**504**
TRAVIS COUNTY WCID 19, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	82	74	66	60	54	48
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 19	DEMAND REDUCTION [TRAVIS]	40	79	114	146	176	203
		122	**153**	**180**	**206**	**230**	**251**
TRAVIS COUNTY WCID 20, COLORADO (K)							
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	106	96	86	77	70	63
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID 20	DEMAND REDUCTION [TRAVIS]	53	103	149	190	228	263
		159	**199**	**235**	**267**	**298**	**326**

Projected Water Management Strategies TWDB

2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2030	2040	2050	2060	2070
TRAVIS COUNTY WCID POINT VENTURE, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	53	57	62	71	82
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	0	0	0	50
MUNICIPAL CONSERVATION - TRAVIS COUNTY WCID POINT VENTURE	DEMAND REDUCTION [TRAVIS]	55	94	146	189	216
		108	**151**	**208**	**260**	**348**
WELLS BRANCH MUD, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	68	66	65	65	65
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	1,300	1,300	1,300	1,300
		68	**1,366**	**1,365**	**1,365**	**1,365**
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY, COLORADO (K)						
DIRECT POTABLE REUSE - WEST TRAVIS COUNTY PUA	DIRECT REUSE [TRAVIS]	336	336	336	336	336
DIRECT REUSE - WEST TRAVIS COUNTY PUA	DIRECT REUSE [TRAVIS]	127	125	120	113	108
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	1,212	1,178	1,182	1,134	1,077
LCRA - EXCESS FLOWS RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	1,000	1,000	2,100	2,100	2,200
MUNICIPAL CONSERVATION - WEST TRAVIS COUNTY PUA	DEMAND REDUCTION [TRAVIS]	1,295	2,034	2,914	3,729	4,530
		3,970	**4,673**	**6,652**	**7,412**	**8,251**
WILLIAMSON COUNTY WSID 3, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	22	20	19	19	19
		22	**20**	**19**	**19**	**19**
WILLIAMSON TRAVIS COUNTIES MUD 1, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	19	18	18	17	17
		19	**18**	**18**	**17**	**17**
WINDERMERE UTILITY, COLORADO (K)						
DROUGHT MANAGEMENT	DEMAND REDUCTION [TRAVIS]	560	560	560	560	560
LCRA - MID BASIN RESERVOIR	LCRA NEW OFF-CHANNEL RESERVOIR (2030 DECADE) [RESERVOIR]	0	400	400	400	400

Projected Water Management Strategies TWDB

2022 State Water Plan Data

WUG, Basin (RWPG)

All values are in acre-feet

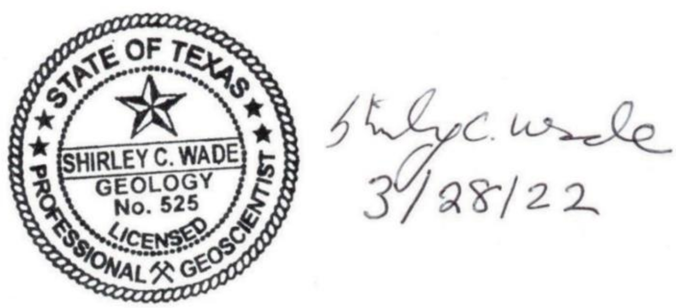
Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
MUNICIPAL CONSERVATION - WINDERMERE UTILITY	DEMAND REDUCTION [TRAVIS]	118	62	29	13	8	7
WATER PURCHASE - WINDERMERE UTILITY	CARRIZO-WILCOX AQUIFER [BURLESON]	0	500	500	500	500	500
		678	**1,122**	**1,489**	**1,473**	**1,468**	**1,467**

Sum of Projected Water Management Strategies (acre-feet)	**31,385**	**63,916**	**121,452**	**153,681**	**183,330**	**241,184**

III. <u>TWDB Groundwater Availability Model Run</u>

GAM RUN 22-006: BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT MANAGEMENT PLAN

Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
(512) 936-0883
March 28, 2022



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GAM RUN 22-006: BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT MANAGEMENT PLAN

Shirley Wade, Ph.D., P.G.
Texas Water Development Board
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(512) 936-0883
March 28, 2022

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator.

The TWDB provides data and information to the Barton Springs/Edwards Aquifer Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information, and this information includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;

2. for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers; and

3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Barton Springs/Edwards Aquifer Conservation District should be adopted by the district on or before August 23, 2022 and submitted to the executive administrator of the TWDB on or before September 22, 2022. The current management plan for the Barton Springs/Edwards Aquifer Conservation District expires on November 21, 2022.

We used the groundwater availability model for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer (Scanlon and others, 2001) to estimate the management plan information for the Edwards (Balcones Fault Zone) Aquifer within the Barton Springs/Edwards Aquifer Conservation District. This report provides supplemental information to the results of GAM Run 08-37 (Oliver, 2008) which used the same model. However, the results in GAM Run 08-37 were based on the steady-state model while results for this analysis are based on the transient model covering the period 1989 through 1998. Additionally, the approach used for analyzing model results is reviewed during each GAM Run report update and may have been refined to better delineate groundwater flows. This report also includes a new figure not included in the previous report to help groundwater conservation districts better visualize water budget components. Table 1 summarizes the groundwater availability model data required by statute and Figure 1 shows the area of the model from which the values in Table 1 were extracted. Figure 2 provides a generalized diagram of the groundwater flow components provided in Table 1. If, after review of the figures, the Barton Springs/Edwards Aquifer Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model mentioned above was used to estimate information for the Barton Springs/Edwards Aquifer Conservation District management plan. Water budgets were extracted for the historical model period for the Edwards (Balcones Fault Zone) Aquifer (1989 through 1999) using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and the flow between aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Edwards (Balcones Fault Zone) Aquifer

- We used version 1.01 of the groundwater availability model for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer. See Scanlon and others (2001) for assumptions and limitations of the groundwater availability model.

- The groundwater availability model for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer is a one-layer model and assumes no interaction with the underlying Trinity Aquifer. The model grid is relatively fine with grid cells that are 1,000 feet long parallel to the strike of the faults and 500 feet wide.

- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Edwards (Balcones Fault Zone) Aquifer located within the Barton Springs/Edwards Aquifer Conservation District and averaged over the historical calibration period, as shown in Table 1.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.

2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.

3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

TABLE 1: SUMMARIZED INFORMATION FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER THAT IS NEEDED FOR THE BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards (Balcones Fault Zone) Aquifer	58,712
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers.	Edwards (Balcones Fault Zone) Aquifer	52,212
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	3,800
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	3,300
Estimated net annual volume of flow between each aquifer in the district	Flow between the Edwards (Balcones Fault Zone) Aquifer and Underlying Units	Not Applicable[1]

[1] Not applicable because the model assumes a no flow barrier at the base of the Edwards (Balcones Fault Zone) Aquifer

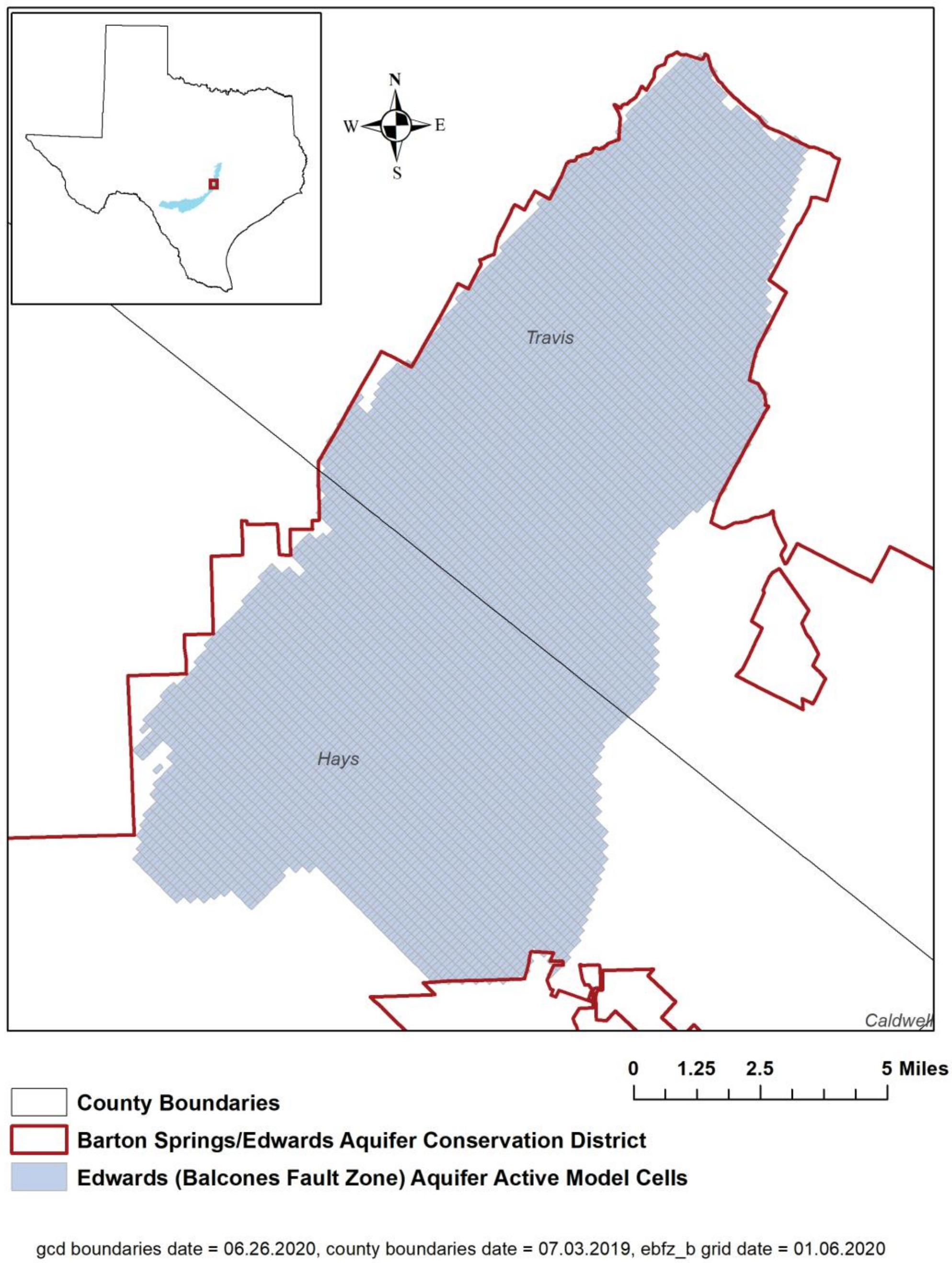
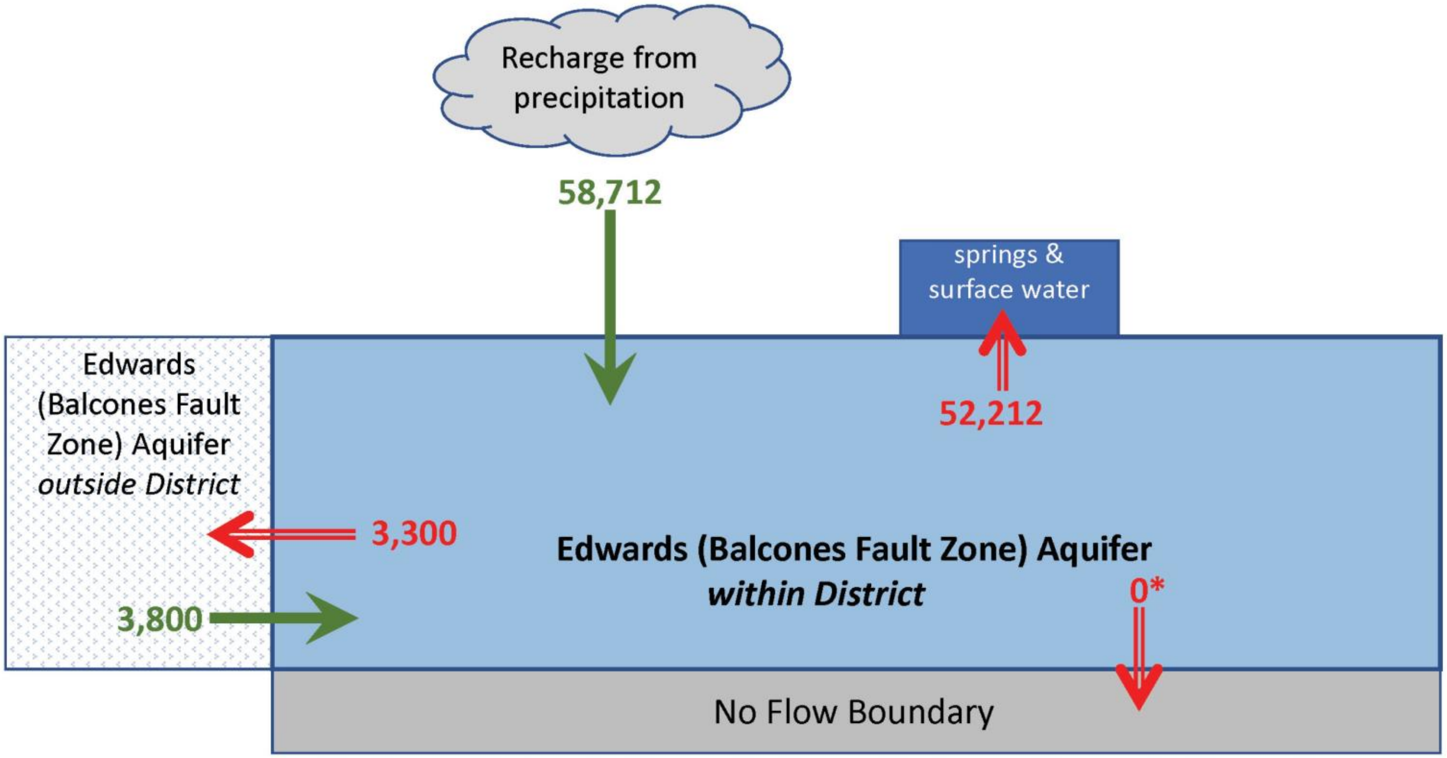


FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE BARTON SPRINGS SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE EDWARDS [BALCONES FAULT ZONE] AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).



*The groundwater availability model for the Gulf Coast Aquifer System assumes a no-flow condition at the base.

Caveat: This diagram only includes the water budget items provided in Table 1. A complete water budget would include additional inflows and outflows. If the District requires values for additional water budget items, please contact TWDB.

FIGURE 2: GENERALIZED DIAGRAM OF THE SUMMARIZED BUDGET INFORMATION FROM TABLE 1, REPRESENTING DIRECTIONS OF FLOW FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER WITHIN BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT. FLOW VALUES EXPRESSED IN ACRE-FEET PER YEAR (AFY).

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

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