

Annual Report for FY 2019 Period (September 2018 - August 2019)

Permit # TE 10607- 0

Endangered Species Act Section 10(a)(1)(B) Permit for the Incidental Take of the Barton Springs Salamander (*Eurycea sosorum*) and Austin Blind Salamander (*Eurycea waterlooensis*) for Managed Groundwater Withdrawals from the Barton Springs Segment of the Edwards Aquifer

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1.0 Introduction and Background

The Barton Springs/Edwards Aquifer Conservation District's ("District") Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) require the District to report annually on the status of the District's program implementation and achievement of conservation measures and objectives. This document is the Annual Report for Fiscal Year 2019, covering the period September 1, 2018 – August 31, 2019.

According to the Incidental Take Permit, the Annual Report shall cover:

1. Descriptions of the Covered Activities undertaken;
2. Reported groundwater withdrawals from permitted wells;
3. Reference well levels;
4. Springflow at Barton Springs;
5. Total Aquifer discharge, measured for permitted wells, estimated for exempt wells, gaged/measured for Barton Springs; and estimated for Cold & Deep Eddy Springs;
6. Drought-stage management reductions;
7. Estimated actual take, if any, for the annual reporting period, and total cumulative take for the ITP term;
8. Minimization measures and actions taken during the prior year;
9. Mitigation actions taken during the year and updates on any ongoing mitigation actions;
10. An evaluation of the effectiveness of the avoidance, minimization, and conservation measures;
11. Adaptive management activities undertaken during the year or indicated as prudent by outcomes of the conservation program;
12. Expenditures by BSEACD on implementation activities;
13. Any species-specific or aquifer research compiled or completed during the prior year;
14. Proposed activities for the next year;
15. Recommendations for improvement; and
16. Any other appropriate information documenting Permittee's compliance with the Permit.

This introduction 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. Included as part of the introduction is a background and an overview of the following:

- 1.1 General Information about the District
- 1.2 Management of Groundwater Resources in the District
- 1.3 Implementation of Management Plan and Habitat Conservation Plan
- 1.4 Background on District's Incidental Take Permit (ITP)

Other major report sections that follow include a summary of the District's minimization measures and mitigation actions taken during the reporting year, a review of the drought management activities, a review of the aquifer status, and an outlook for planned activities.

Additionally, included as Appendix D of this annual report, is a summary of the meeting discussion and comments received from the HCP Management Advisory Committee (MAC). The District has established an HCP Management Advisory Committee (MAC) to advise and assist the Board in the coordination of conservation activities affecting Covered Species at Barton Springs, and in monitoring and helping the Board improve the implementation of the District HCP for the District. This MAC is an additional measure to ensure continued improvement of the HCP and compliance with the ITP as well as to ensure the Board is aware of any stakeholder concerns regarding the execution of the HCP and revisions to the HCP. The primary purpose of the MAC is to review and comment on the District's HCP annual reports or on selected aspects of those reports, in its continuing improvement role. At the Board's discretion, the MAC may also be requested to:

- Provide a forum for exchange of information relative to Covered Species,
- Provide ad hoc advice on Covered Species management activities,
- Advise the District on priorities for conservation actions, as warranted, and
- Provide input and recommendations, as warranted, on the development and implementation of actions through the adaptive management program.

The MAC was appointed by the District Board in early 2013 and includes independent, volunteer representatives with biological or natural-resource management responsibilities from designated interest groups. MAC composition focused on perspectives useful to the active management of the Aquifer and the habitat of Covered Species at Barton Springs. The U.S. Fish and Wildlife Service (Service) was also requested to provide a non-voting representative to be liaison between the District, the Service, and the MAC. The MAC will convene in some manner appropriate to the purpose of each meeting and no less frequently than annually, and at such other times as they decide or as requested by the Board.

1.1 General Information about 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, groundwater conservation districts (GCDs) such as the Barton Springs Edwards Aquifer Conservation District ("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.

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 as show in Figure 1. 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. The District participates in joint-regional planning with these and other GCDs in GMAs 9 and 10 which are configured generally to encompass the Trinity and Edwards Aquifers respectively.

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*) which are both 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 over time the region has become more urban in areas of south Austin, Buda, Kyle and San Marcos. Groundwater use in the area is now primarily use utilized for domestic and public water supply purposes, with lesser amounts also being utilized for commercial, irrigation, and industrial use. See Figure 2 for a general breakdown of the types of wells in the District and percentage of permitted production for each classification category.

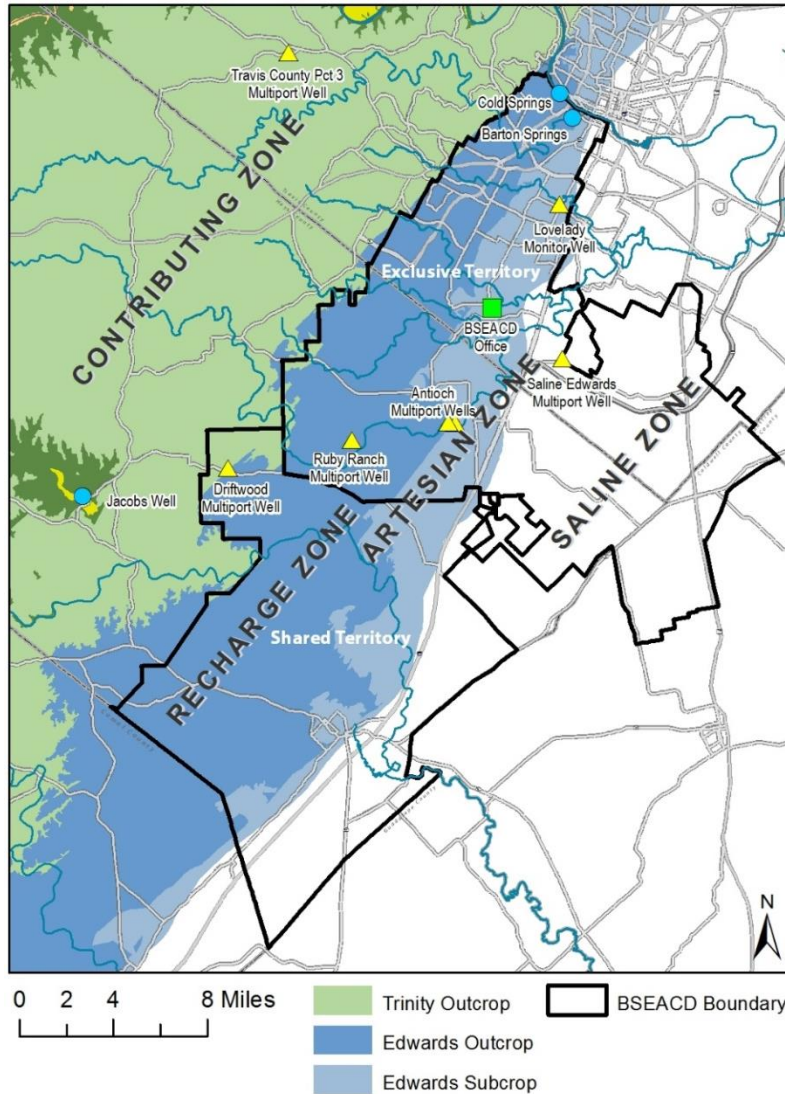


Figure 1. Location of the Barton Springs/Edwards Aquifer Conservation District

This map displays the District's boundaries, major aquifers, hydrogeologic zones, key springs, and sentinel monitoring wells.

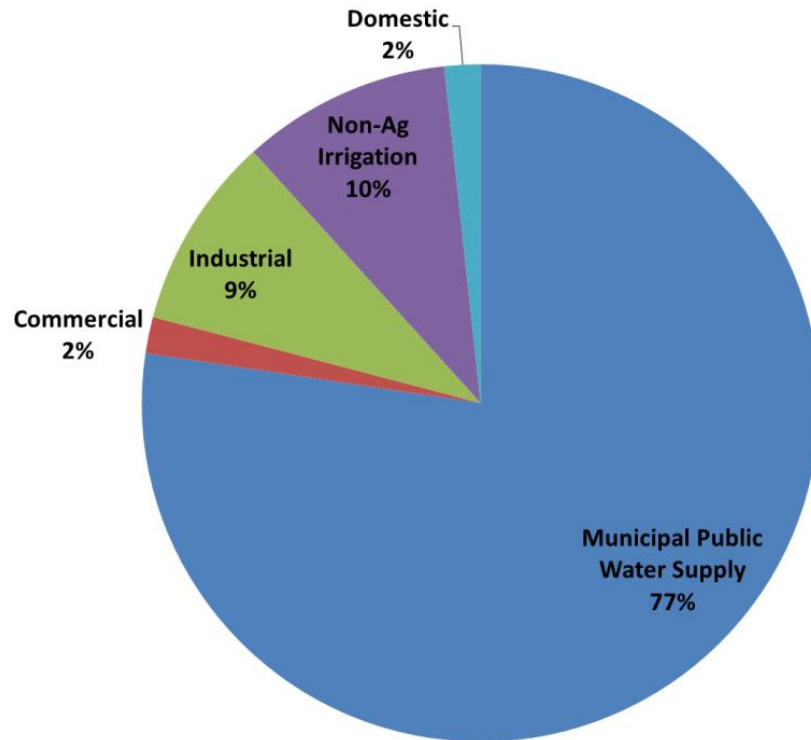


Figure 2. Types of Groundwater Use and Their Percent of Authorized Use for Permitted Wells in the District

1.2 Management of Groundwater Resources in the District

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 District established a precedent for developing the governing policies 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. The evolution of the District's policies and strategies 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.

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. 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 the District's Management Plan (MP) applies a three-part evaluation to affirm beneficial use in accordance with demand-based permitting standards, and to evaluate the full range of potential impacts for each production permit request. The three-part permit evaluation involves an assessment of reasonable non-speculative demand, local scale evaluations, and aquifer scale evaluations. 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 that show greater potential to cause unreasonable impacts.

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, Extreme Drought Withdrawal Limits, the Ecological Flow Reserve, and Management Zones) 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 MP 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 as shown in Table 1. The curtailments are derived on the basis of 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 non-speculative demand, monthly reporting of actual groundwater production by permittees, and active enforcement of monthly curtailments are integral to effective drought management in order 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.

Table 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 Management Zone Permit Type		Edwards Aquifer					Trinity Aquifer				
		Eastern/Western Freshwater					Saline	Lower	Middle	Upper	Outcrop
		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.

1.3 Implementation of Management Plan and Habitat Conservation Plan

The provisions of the District’s Management Plan (MP) and Habitat Conservation Plan (HCP) 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 the District’s Management Plan and Habitat Conservation Plan. The District will encourage cooperation and coordination with relevant entities in the implementation of these plans.

The District has adopted and implemented 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 are consistent with the provisions of these plans and are adopted on the basis of the best available science, public and stakeholder input, and recommendations of competent professionals. Further, the rules comply with TWC Chapter 36 and the

District's enabling legislation. All rules are 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/>.

In order to achieve the goals, management objectives, and performance standards adopted in these plans, the District continually works to develop, maintain, review, and update rules, policies, and procedures for the various programs and activities described within the MP and HCP. As a means to monitor performance, the District implements various goals, management objectives, and performance standards adopted in these plans. On an annual basis, the District develops annual reports for the MP and HCP that document progress made towards implementation and achievement of the goals and objectives.

All specific activities undertaken by the District in this FY 2019 reporting period, whether considered as direct or indirect management of the Aquifer are described in more detail in the latest "FY 2019 Management Plan Annual Report", which can be viewed and downloaded at:

<https://bseacd.org/uploads/FY-2019-Final-Annual-Report-Audit-and-App-B-12.12.19.pdf>

1.4 Background on District's Incidental Take Permit (ITP)

The District is charged with the management of the Barton Springs segment of the Edwards Aquifer ("Aquifer"), which is the primary water supply for more than 60,000 people in the region and the source water for the Barton Springs complex. The District manages this resource by a production permit-based regulatory program for larger, non-exempt wells, and these regulatory program elements constitute the Covered Activities described in the HCP. The overarching strategic purpose of the District is to optimize the sustainable uses of groundwater for these users and other community interests.

However, it is well established that during drought conditions large amounts of groundwater withdrawals (pumping) will contribute to diminished flow through the Aquifer and smaller springflow rates at Barton Springs and associated adverse effects to some Aquifer users. The Aquifer and its associated spring outlets are the sole habitat of the federally-protected Barton Springs salamander (BSS) and Austin blind salamander (ABS). The federal Endangered Species Act prohibits the harassment or harm of the salamanders (termed "take") that may incidentally occur as a result of the effect of pumping on decreasing water levels and springflows unless exempted under a federal Incidental Take Permit (ITP).

The District's activities that create the need for an HCP and an ITP relate to the following groundwater management functions of the District:

- Adopt, implement, and enforce regulations and management programs that protect existing groundwater supplies, improve aquifer demand management, provide

Aquifer and springflow protection during droughts, promote and improve aquifer recharge, and carry out other beneficial management strategies; and

- Avoid, or minimize, and mitigate negative impacts upon federally listed species dependent upon springflow from Barton Springs through adoption and implementation of regulations, management programs, scientific research programs, conservation education programs, and collaborative efforts with other governmental entities.

These activities directly and indirectly affect withdrawals (groundwater production) from the Aquifer. In turn, as a result of the hydrology of the groundwater system, such withdrawals lower the water levels in the Aquifer, which consequently reduces the discharge (springflow, or flow) at Barton Springs. There is a well-established relationship, within the observed data range, between the flow issuing from the outlets of Barton Springs and the chemistry of the water. As flow decreases, the dissolved oxygen (DO) concentration of the water, which is required by the Covered Species for survival, decreases, and the concentration of dissolved solids increases. This natural variation in water chemistry derives from the physical system of the Aquifer, and it occurs regardless of whether Aquifer water-levels and springflow decreases are due to drought, withdrawals by wells, or both.

During normal and high-flow conditions in the Aquifer, the combined flow of the natural outlets at Barton Springs are minimally affected by the total amount of water that is being withdrawn by wells in the Aquifer. Under these conditions, the District's program elements principally address the long-term sustainability of the Aquifer as a water supply. Under these high-flow conditions, the amount of water withdrawn from the Aquifer by pumping wells and the provisions of the District's regulatory program are believed to have essentially no effect on the chemistry of the springflow. This is because the physical and chemical characteristics of the springflow are mostly attributable to meteorologically induced stormflows and seasonal factors, and from time to time, other external factor.

Accordingly, essentially no incidental take is attributable to the Covered Activities (lawfully conducted withdrawals from District permitted wells, see HCP Section 4.1, Proposed Covered Activities) when water levels in the Aquifer are above a certain elevation, which determines the flow at the Aquifer's major outlet, Barton Springs.

But during drought, and especially prolonged severe or Extreme Drought, the amount of water naturally discharging from the springs complex (the natural spring outlets taken together) is much smaller, similar in magnitude to the amount of water withdrawn from wells. During these drought conditions, the District's groundwater drought management program is key to preserving groundwater levels in the Aquifer and springflow. The joint and regional water planning conducted by the State, with which the District's groundwater management plan is integrated, uses a recurrence of the drought of record in the 1950s (DOR) as the planning objective, and the DOR is also the framework for the District's drought management program. The District's integrated regulatory

program is designed to protect the water supply of Aquifer users who are most vulnerable to supply interruption during periods of Extreme Drought and to conserve the flows at Barton Springs for both ecological and recreational purposes.

It is during certain of these drought periods that the groundwater levels and springflows unavoidably decline sufficiently to create incidental take of the Covered Species, which creates the programmatic need for the HCP and the ITP. The circumstances that give rise to such incidental take are discussed in detail in HCP Section 5.2.2, Spatial and Temporal Extent of Take, and HCP Section 5.2.3, Consideration of Take and Jeopardy.

The cumulative withdrawals of all operating wells in the Aquifer can have significant impact on springflow during drought conditions and can increase the likelihood of low-flow conditions. Since June 2008, despite increased demand for water supplies in the District, withdrawals generally have been reduced as a result of groundwater management policies and regulations of the District and of responses by its permittees to projected shortfalls during severe droughts. As the demand for groundwater has increased, the District has gradually changed its drought management and regulatory program to improve the effectiveness of Aquifer and springflow protection, supported in no small part by the studies and planning for the ongoing HCP development.

The HCP specifies the District commitments to a set of conservation (avoidance, minimization, and mitigation) measures that are consistent with statutory authorities of the District and that are based on sound science and effective groundwater management practices. The District HCP has been formulated and framed in collaboration with other conservation efforts affecting the Covered Species and their respective habitats; that is, the habitat conservation plan of the COA for operation and maintenance at Barton Springs Pool and surrounding area, including particularly the individual spring outlets (Barton Springs Pool HCP). The well owners and users, especially the District's permittees (the Regulated Groundwater Community), and all citizens who consider Barton Springs an ecological, recreational, and aesthetic resource, are the key additional stakeholders for this HCP.

2.0 Descriptions of the Covered Activities Undertaken

The District's Incidental Take Permit (ITP) allows for continued managed pumping (the covered activity) of the Aquifer by District permittees, provided the proposed HCP measures minimize and mitigate the incidental take and avoids jeopardy of salamanders. Ultimately, the HCP measures safeguard the continued sustainable use of the Aquifer and survival of the endangered salamanders.

The ITP identifies two categories of Covered Activities: groundwater withdrawals from the Aquifer by nonexempt permittees; and actions necessary to manage potential habitat of the Covered Species in the ITP Area.

Managing Groundwater Withdrawals

Managing groundwater in its jurisdictional area is the primary purpose of a groundwater conservation district (GCD), and managing withdrawals of groundwater in accord with its authorities is a primary activity of a GCD. The District employs a set of groundwater-management activities that relate directly to active management of groundwater withdrawals from the Barton Springs segment of the Edwards (and from all aquifers). These active aquifer-management activities are an essential part of the District's groundwater management scheme and generally recur every year; they include:

- Renewal of existing production permits
- Processing of new permit applications
- Installation and operation of wells to monitor groundwater levels and quality
- Participation in joint groundwater planning with other GCDs in relevant groundwater management areas, and monitoring desired future condition (DFC) efficacy and compliance
- Monitoring groundwater drought status and informing the District Board of Directors of changes in drought status and need for responsive action
- Using well site inspections and actual production reports to evaluate compliance with applicable rules and need for potential enforcement actions
- Evaluating permittees' long-term actual withdrawals vis a vis their authorized amounts and recommending award of conservation credits
- Assessing the efficacy of existing rules to protect groundwater systems, to promote conservation measures, to achieve and maintain applicable DFCs, and as warranted recommending possible regulatory improvements for Board consideration (in the reporting period, the Rules were not required to be amended).

In addition to the recurring activities above, there are many other important activities conducted that are considered as *indirect* management of the Aquifer. Those indirect activities include:

- 1) program-supporting scientific investigations and monitoring, educational and outreach programs, internal and external communications and coordination, and legal support actions;
- 2) initiatives that improve the efficiency and effectiveness of other programs; and
- 3) activities required for governance and administration of a public agency.

Generally, such activities differ in specifics from year to year. Successful groundwater management of the Barton Springs segment of the Edwards under the Habitat Conservation Plan (HCP) requires operation and maintenance of a fully functioning GCD in compliance with all applicable statutes and Rules in its entire jurisdictional area.

All specific activities undertaken by the District during this reporting period, whether considered as direct or indirect management of the Aquifer are described in greater detail in Appendix C of this report. Appendix C is intended to reflect the detailed progress, activities and actions implemented by the District to achieve the HCP minimization measures. Appendix C is an excerpt from the FY 2019 Management Plan Annual Report referred to as, *“Appendix B - Assessment of Progress toward Management Plan Goals and Objectives”*

The FY 2019 Management Plan Annual Report comprises a supporting complement to this stand-alone “Habitat Conservation Plan Annual Report”. The FY 2019 Management Plan Annual Report, which can be viewed in full and downloaded at: <https://bseacd.org/uploads/FY-2019-Final-Annual-Report-Audit-and-App-B-12.12.19.pdf>

Managing Potential Habitat of Covered Species

The Covered Activities related to managing groundwater withdrawals described above are, by design, also intended to protect potential habitat of the Covered Species throughout the Aquifer in an ongoing basis, but especially during critical drought periods when the endangered species are under additional stress. Covered Activities that are related more directly to the management of potential habitat by the District involve District decision-making and actions that support the general Biological Goals and the more explicit, quantitative Biological Objectives expressed in the District HCP’s Section 6.1. These measures are intended to assure that reduction in springflow is minimized and the corresponding dissolved-oxygen (DO) concentrations in the perennial spring outlets do not fall below specified minimum values under various springflow conditions. Drought indices of Barton Springs coupled with the Lovelady monitor well are the principle method of managing pumping during drought, and thereby preserving habitat.

Both springflow and dissolved oxygen are measured and reported in real-time by the U.S. Geological Survey. These data can be found online at: https://waterdata.usgs.gov/tx/nwis/uv/?site_no=08155500&agency_cd=USGS&

Water levels are measured and reported in real-time by the U.S. Geological Survey. These data can be found online at: https://waterdata.usgs.gov/tx/nwis/uv/?site_no=301237097464801&PARAMeter_cd=72019

Table 2. provides a summary of DO concentration measured and reported by the USGS. The results are well above the minimum concentrations specified in the

Biological Objectives. Further, no unanticipated adverse effects of HCP-related activities on water chemistry were documented in the reporting year. Consequently, no extraordinary District actions, beyond those in the Covered Activities and HCP Conservation Measures, were required to actively manage the potential habitat and to comply with the Biological Goals and Objectives.

Table 2. Range of Springflow and Dissolved Oxygen (USGS 08155500)

Month	Historic Mean DO (mg/L)	FY19 DO (mg/L)	Historic Mean Flow (cfs)	FY19 Flow (cfs)
Sep-18	5.6	5.5	60	54
Oct-18	5.8	5.8	58	82
Nov-18	5.8	6.4	60	94
Dec-18	6.0	6.7	61	100
Jan-19	6.2	6.8	64	117
Feb-19	6.1	ND	66	122
Mar-19	6.0	7.0	68	112
Apr-19	6.0	6.7	70	101
May-19	5.5	ND	71	108
Jun-19	5.5	ND	72	111
Jul-19	5.5	ND	69	110
Aug-19	5.4	6.4	63	103
Mean annual		6.4		101.0

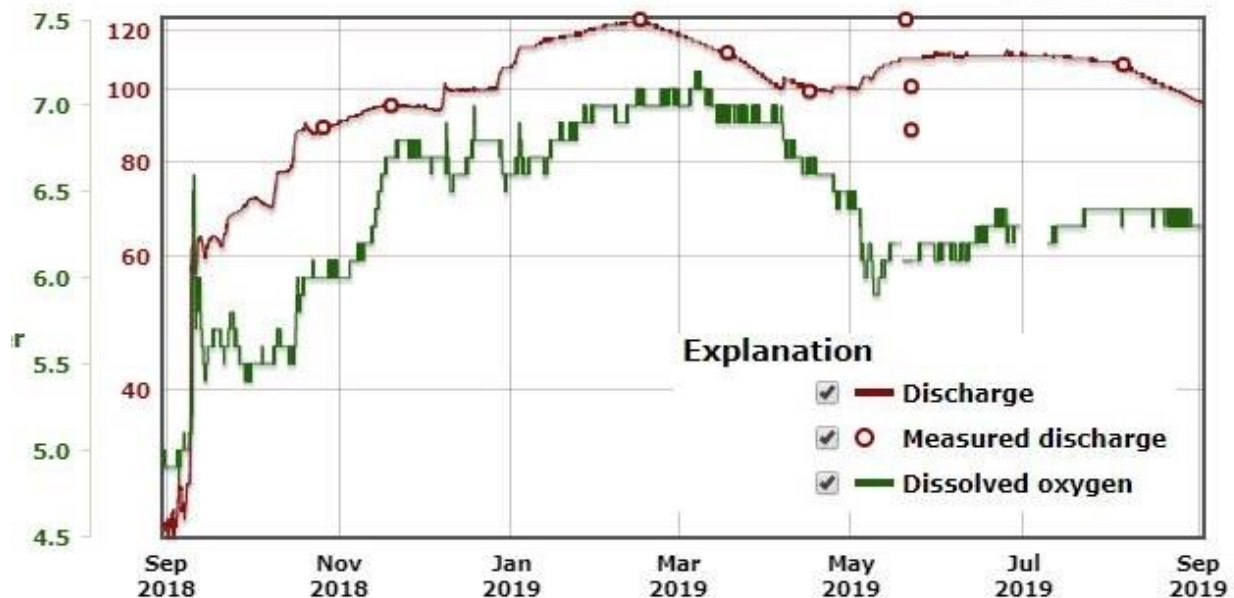


Figure 3. Hydrograph from the USGS of mean daily springflow and DO values.

In addition to considerations arising from the HCP Biological Goals and Objectives, there were two additional activities that specifically relate to managing management of potential habitat in the reporting period.

1. As a first-year activity required by the approved HCP, the District provided a Validation Monitoring Protocol that will be used annually to determine if new information suggests that the District's take estimate methodology should be re-evaluated. The results of this evaluation will be part of each HCP Annual Report, Section on Recommendations for Improvement. The current Validation Monitoring Protocol is included in this Annual Report in Appendix A.
2. At an over-arching level, the successful negotiation and initial execution of an Interlocal Agreement/Memorandum of Understanding (ILA) between the District and the City are particularly noteworthy activities in the reporting year. The ILA is designed to facilitate data and information sharing between the parties and collaboration on activities directly related to habitat characterization and protection. The ILA will enable more efficient implementation of beneficial HCP Conservation Measures, especially Mitigation Measures. The ILA is included in this Annual Report in Appendix B.

3.0 Reported Groundwater Withdrawals from Permitted Wells

The actual amount of groundwater withdrawn from non-exempt wells, i.e., wells with permits issued by the District, is shown in Table 3, along with the authorized permitted production amounts.

Table 3. Actual and Permitted Nonexempt Production by Management Zone

Table 3a. Individual Production Permits (Nonexempt):

FY 2019 Production from Individual Production Permits		
Production Zone	Actual Production	Permitted Production
Edwards	1,550,915,519	2,660,777,544
Trinity	200,300,364	506,381,557
Austin Chalk or Alluvial	174,450	2,500,000
Total (Gallons)	1,751,390,333	3,169,659,101
	(5,374.81 ac ft)	(9,727.31 ac ft)

Table 3b. Limited Production Permits (Nonexempt General Permits by Rule):

FY 2019 Production from Limited Production Permits		
Production Zone	Actual Production*	Permitted Production
Edwards	12,235,041	58,500,000
Trinity	4,078,347	19,500,000
Austin Chalk or Alluvial	0	0
Total (Gallons)	16,313,338	78,000,000
	(50.06 ac ft)	(239.37 ac ft)
*Actual production is a volume estimate calculation described in the findings and conclusions of the BSEACD Staff Report 2010. Average annual exempt well production is approximately 104,473 gpy		

In this reporting period, the amount of groundwater actually withdrawn from the Barton Springs segment of the Edwards Aquifer was considerably below the amount permitted. In aggregate, the amount of groundwater actually withdrawn from the Edwards Aquifer by permitted wells in the reporting period was **1,563,150,560** gallons.

A summary of the permitted production volumes for each Management Zone is provided below in Table 4.

Table 4. Permitted Production by Management Zone

FY 2019 Permitted Production by Management Zone			
Edwards MZs	gallons	cfs	acre-feet
Historical (Individual)	2,309,082,596	9.79	7,086
Historical (LPP)	2,500,000	0.011	8
<i>Total Historical</i>	<i>2,311,582,596</i>	<i>9.80</i>	<i>7,094</i>
Conditional (Individual)	351,694,948	1.49	1,079
Conditional (LPP)	56,000,000	0.24	172
<i>Total Conditional</i>	<i>407,694,948</i>	<i>1.73</i>	<i>1,251</i>
Total Edwards Aquifer	2,719,277,544 gal	11.53 cfs	8,345 ac ft

Trinity MZs	gallons	cfs	acre-feet
Historical (Individual)	506,381,557	2.15	1,554
Historical (LPP)	19,500,000	0.08	60
Total Trinity Aquifer	525,881,557 gal	2.23 cfs	1,614 ac ft

Other Aquifers MZs	gallons	cfs	acre-feet
Historical (Individual)	2,500,000 gal	0.01 cfs	8 ac ft
Historical (LPP)	0	0	0
Total Other Aquifers	2,500,000 gal	0.01 cfs	8 ac ft

Total Permitted (All Aquifers)	3,247,659,101 gal	13.77 cfs	9,967 ac ft
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A summary of the estimated exempt use production volumes for the Edwards is provided below in Table 5.

Table 5. Permitted Production by Management Zone

Edwards Aquifer - Estimated Exempt Wells Production	
Estimated Volume of Exempt Well Production (gpy)*	105,514,157
Est # of wells	1009
cfs	0.45
% of Permitted Production	4.26%
Total Permitted Edwards Production (gpy)	2,719,277,544
*2010 BSEACD Staff Report – Avg Exempt Well Use=104,573 gpy	

4.0 Reference Well Levels

The primary reference well that the District uses to gauge overall groundwater levels in the Aquifer, to determine drought stages that trigger various elements of the District’s drought management program, and to estimate take of Covered Species, is the “Lovelady well”, near the intersection of Stassney Lane and South First Street in South Austin. The hydrograph of this well for the reporting period is shown below.

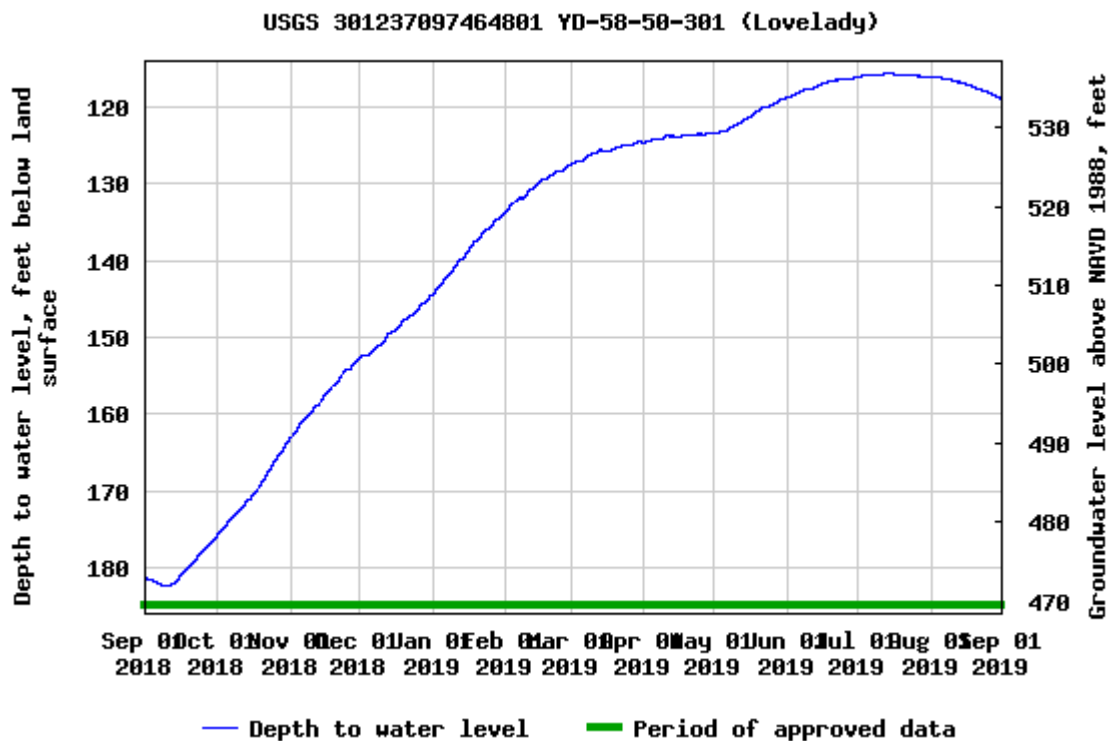


Figure 4. Hydrograph of the Lovelady water level shown as depth to water and elevation.

Data from Barton Springs and the Lovelady well informed the drought management determinations by the District's Board. Following the Drought Trigger Methodology, drought is declared when either Lovelady or Barton Springs reaches their respective thresholds. Non-drought conditions are declared when both Barton Springs and Lovelady well have recovered above the respective drought trigger thresholds. Section 7 describes the drought stage management for this reporting year.

5.0 Springflow at Barton Springs

The hydrograph of the combined springflow at Barton Springs, as indicated by the US Geological Survey (USGS) gage, for the reporting period is shown in Figure 5.

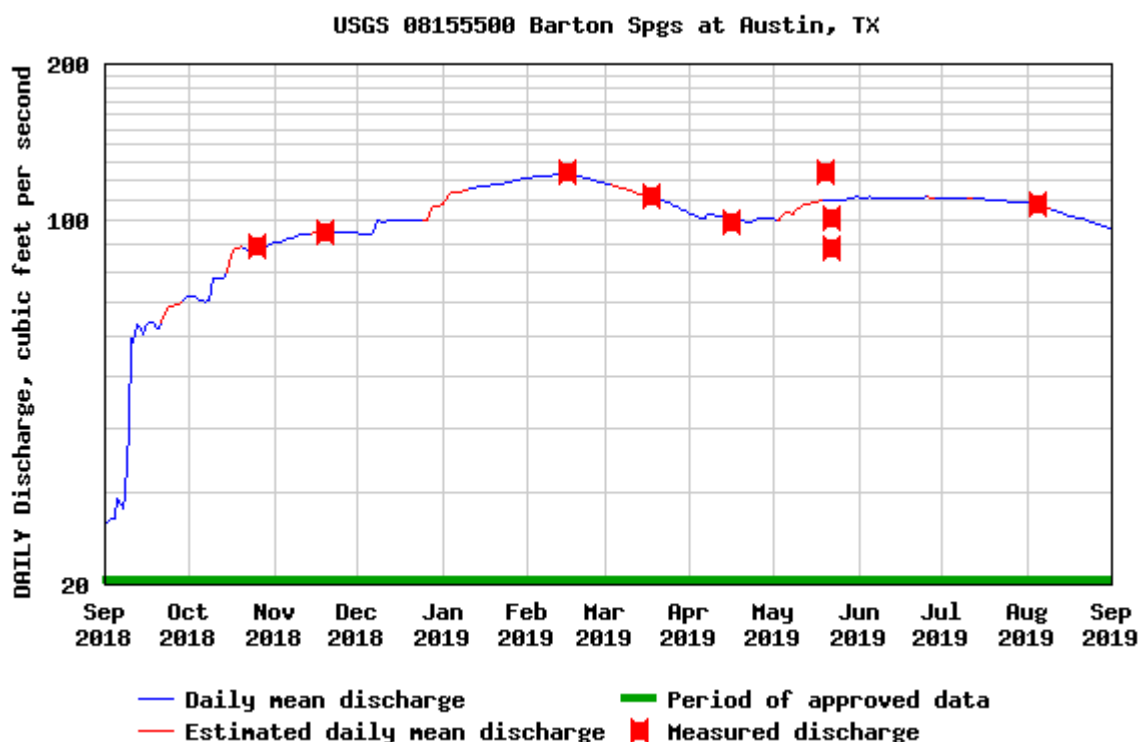


Figure 5. Hydrograph of daily mean Barton Springs flow shown with manual field measurements.

Monthly mean statistics are reported in Table 2. Some other statistics concerning spring flows during the reporting period are:

- Maximum daily discharge: 124.0 cfs (2/15/2019)
- Minimum daily discharge: 26.2 cfs (9/1/2018)
- Mean daily discharge: 101.0 cfs

6.0 Total Aquifer Discharge

The determination of total Aquifer discharge in any reporting year requires consideration of: measured (metered) discharges from permitted wells, the prevailing estimate of use by exempt wells, gaged measurements of combined discharge at Barton Springs, and an estimate of discharge at Cold & Deep Eddy Springs. There is a large degree of uncertainty with the amount of discharge that may flow to the south into the San Antonio segment of the Edwards aquifer during high-flow conditions. During the FY 2019, the total actual discharge from the Aquifer by source is estimated in Table 2.

Table 6. Estimated total discharge from the Barton Springs segment of the Edwards Aquifer

Discharge Source	FY 2019 Actual Use Volume (gpy)	Equivalent Monthly Mean Flow Rate (cfs)	Comment
Individual Production Permits	1,550,915,519	6.57	Monthly meter measurements; see Section 3 above
Limited Production Permits by Rule	12,235,041	0.05	See Section 3 above
Exempt Wells	105,514,157	0.45	See Section 3 above
Discharge at Barton Springs	286,012,000,000	101.0	Table 2. Mean daily discharge (USGS)
Discharge at Cold & Deep Eddy Springs	3,490,000,000	15.0	Estimated Mean; cited in Hunt et al., 2019
Total Aquifer Discharge	291,170,664,717	123.07	

7.0 Drought-stage Management Reductions

Based on flow at Barton Springs and water levels at the Lovelady Well, the District declared Stage II Alarm Drought on July 12, 2018 and remained in Alarm Stage II status until October 11, 2018. During FY 2019 (reporting period of September 1, 2018 - August 31, 2019), drought compliance was assessed for the month of September and after lifting drought status in October, the District was in a No-Drought status for the remainder of the fiscal year. During Stage II Alarm Drought, all permittees collectively reduced pumpage by an aggregate of 43% (Table 7). The permittees initiated the mandatory reductions for one month, September 2018.

- **No Drought:** 10 months
- **Stage II Alarm Drought:** 1 full month of mandatory reductions in effect for September 2018 (District declared drought: July 12, 2018 to October 11, 2018).
- **Stage III Critical Drought:** 0 months
- **Stage IV Exceptional Drought:** 0 months
- **Stage V Emergency Drought:** 0 months

The reductions achieved by the drought management program for wells in the Edwards Aquifer are summarized as follows:

Table 7. Drought Stage Reductions Achieved

Stage II Alarm Drought – 20% Mandatory Reduction Edwards Aquifer Monthly Production				
Month	Permitted Production (Baseline at No Drought)	Drought Production Target (20% reduction)	Actual Production	% Curtailment Achieved
September 2018	261,052,647	208,842,117	112,386,543.00	43%
TOTAL	261,052,647	208,842,117	112,386,543	43%

The volumes above in Table 7 only relate to non-exempt permitted wells with individual production permits. These permittees have individual drought management plans that are enforced by the District when there is a declared drought stage. In addition, some voluntary drought-period reductions are made by some Limited Production Permit holders and some exempt well users, but these are not mandatory and are small in comparison to the regular non-exempts.

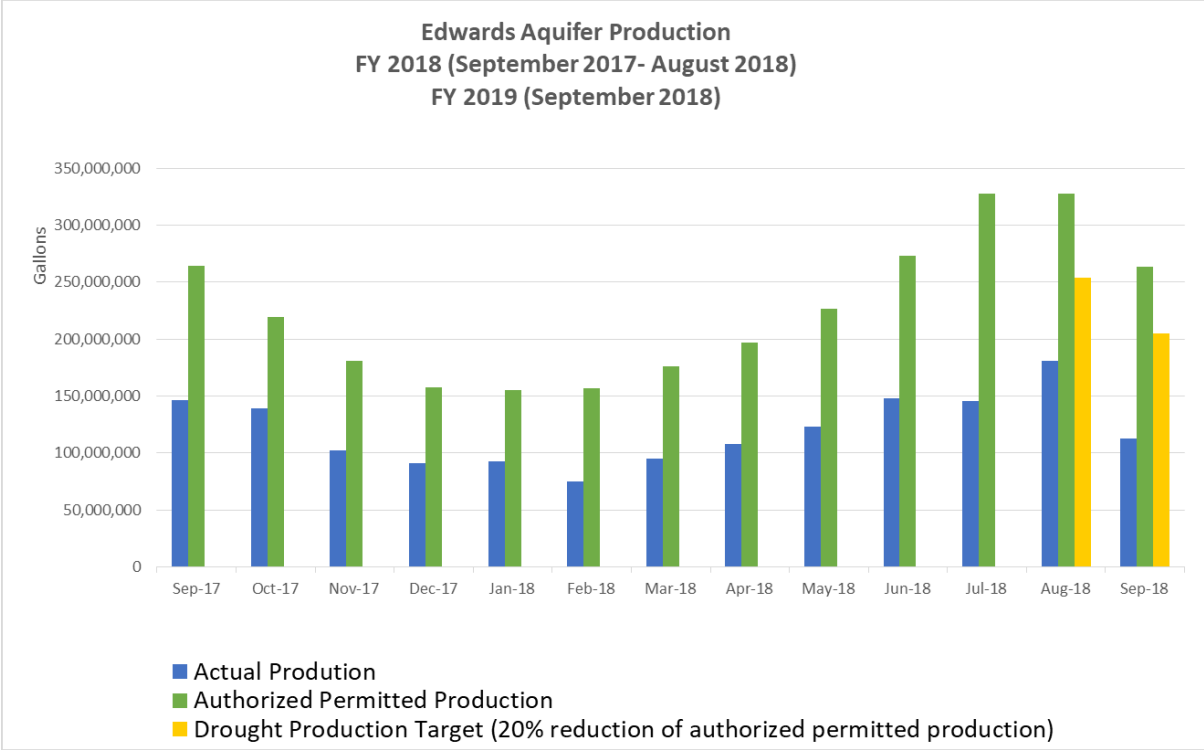


Figure 6. Hydrograph of Monthly Production Limits and Monthly Actual Use.

Figure 6 and Figure 7 reflect the overall trend that collectively, the permittees’ actual production is on average lower than their authorized permitted production allocations. During early stages of drought, the District anticipates that most permittees can achieve compliance with 20% curtailments without having to make significant changes in their normal operations. The month of September 2018 was the only month of declared drought in FY 2019 and when compared to September 2017 there are minor yet notable differences in actual production.

It should be noted that the curtailment shown in Table 7 and the actual production in Figure 6 was achieved due to a combination of the mandatory reductions, outreach by the District, and decreasing demand due to wet weather conditions at the end of September 2019. It should also be noted that other factors such as climatic conditions, seasonal trends, and alternative supply sources can contribute to the actual use trends. However, as stated in the HCP the District has demonstrated effective drought curtailments and compliance that correspond to longer and more severe drought conditions, such as in 2009 and 2011.

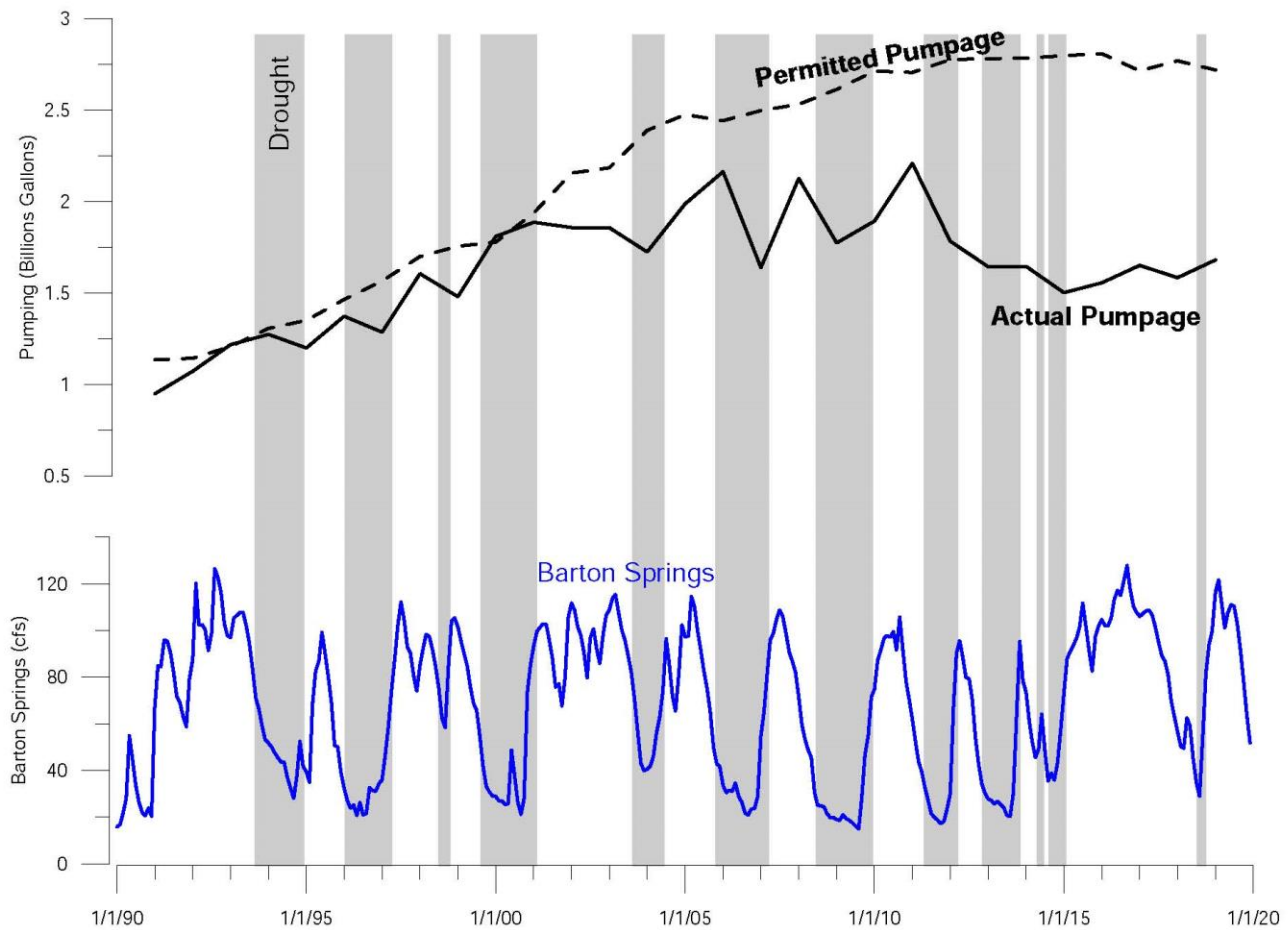


Figure 7. Hydrographs of Edwards Aquifer Production and Barton Springs Flow.

Figure 7 reflects production and spring flow since 1990. The data indicate that over the past 20 years there has been a trend of lower total actual production than authorized production in the Edwards Aquifer. This overall trend is likely the result of the District's efforts in public awareness and drought conservation, the promotion and support the Public Water Supplier's diversification of source supplies, improved water use efficiencies and key milestones in the District's science and regulatory framework. Some of those milestones include:

- 2004: Sustainable Yield Study and Conditional Production Permits
- 2005: Drought Trigger Methodology
- 2007: Extreme Drought Withdrawal Limitation (EDWL)
- 2009: Ecological Flow Reserve and Management Zones

8.0 Estimated Annual Take for Reporting Period (if any) and Total Cumulative Take for the ITP Term

The actual annual springflow-related take estimate to be included in the District's Annual Report to the Service involves a rather straight-forward procedure outlined in Appendix A that indicates the relative % of time springflow is below a given springflow threshold.

The hydrographs and data presented in Section 2 show that the springflow was only below the 40 cfs threshold for take for 8 days (0.27 months) during FY 2019 (reporting period of September 1, 2018 - August 31, 2019). Analysis of the hydrograph indicates that several time periods in FY 2019 were accompanied by take of both Covered Species. Using the Validation Monitoring protocol proposed by the District and approved by the U.S. Fish and Wildlife Service for evaluating take (Appendix A), the District calculates the following amounts of take for the reporting period presented in Table 8. In summary, those estimates of take are derived by:

We estimate take of 15 salamanders occurs for the Barton Springs Salamander under category A when Barton Springs flow decreases to below 40 cfs (Table 8; Circumstance A). This is primarily due to Upper Barton Springs ceasing flow and potentially induces negative behavior affects. We further estimate additional take for both species as a function of the number of months when springflow is within 30 to 20 cfs. The estimated take number is derived by the number of months (0.27 months in this case) multiplied by each take factor for each species (Table 8; Circumstance B). The negative effects on the species associated with this are thought to be primarily behavioral. Springflow below 20 cfs (Table 8; Circumstance C) did not occur for this reporting period. However, the method to estimate take would be the same as Circumstance B, however it is believed that the negative effects on the species could be more physiological in nature.

Table 8. Summary of Take

CIRCUMSTANCE	NO. DAYS	NO. MONTHS	BSS TAKE FACTOR	ABS TAKE FACTOR	BSS SUM TAKE	ABS SUM TAKE	COMMENT
A (<40 CFS)	0	0.00	15	0	0	0	
B (30-20 CFS)	8	0.27	174	36.6	46	10	
C (<20 CFS)	0	0.00	174	36.6	0	0	
SUM		0.27			46	10	2019 total
					20200	4260	permitted take over 20-yrs
					20154	4250	Balance on permit
					0.2%	0.2%	% of total allowed

BSS: Barton Springs salamander; ABS: Austin blind salamander

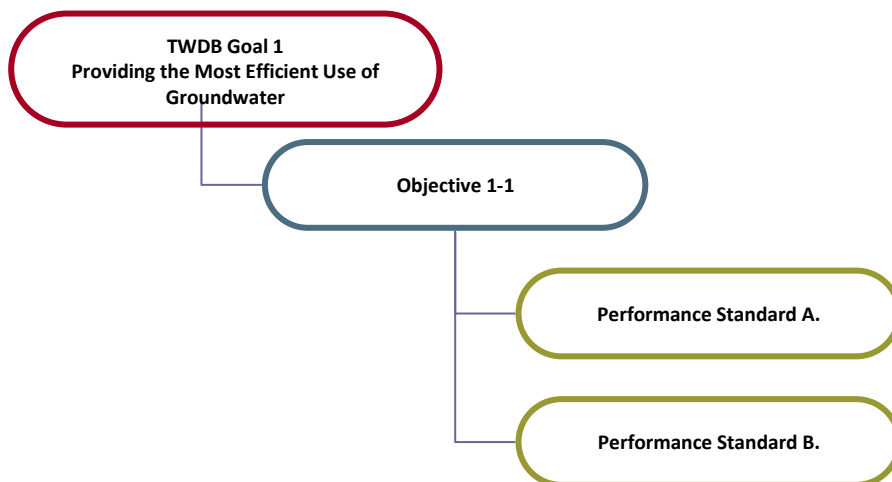
Thus, during this reporting period take of Barton Springs salamander (BSS) is estimated to have been 46 and take of Austin blind salamander (ABS) is estimated to have been 10, using the prescribed methodology. We estimate that the negative effects, and thus the nature of take, were likely behavioral in nature. These amounts of take are added to the previously reported cumulative take amounts, resulting in new cumulative take amounts of 46 for BSS and 10 for ABS. For comparison, the authorized total cumulative take estimates for BSS and ABS during the 20-year permit term are 20,200 and 4,260, respectively. This represents 0.2% authorized total.

There was also no take from the DO Augmentation mitigation measure, as those activities in the field have not yet begun.

9.0 Minimization Measures and Action Taken During the Prior Year

Conservation measures to avoid, minimize, and mitigate take by the District are by necessity rooted in the statutory and regulatory requirements for all groundwater conservation districts in Texas. The Texas Water Development Board (TWDB) has set nine over-arching goals for all GCDs, and in this District these goals have also been designated as categories of Minimization Measures in its ITP issued by the Service.

Each GCD establishes a hierarchy of objectives and performance standards to achieve its goals that reflect local groundwater management priorities and to ensure its continuing operation as a sustainable organization. The hierarchy is depicted schematically below:



- **Goals** are set by the TWDB. These 9 goals are addressed in the District's Management Plan.
- **Objectives** are set by District Staff/Board. These objectives are the same objectives for the HCP.
- **Performance Standards** are set by District Staff/Board. These performance standards are the same reporting standards that have to be completed for the HCP. Many of these standards have always been reported on in previous Management Plan Annual Reports.

The GCDs' selected objectives and standards are documented in the GCDs' adopted MPs and approved by the TWDB every five years.

As a result of its habitat conservation planning, in its current MP the District has prioritized its objectives and performance standards such that the HCP Conservation Measures now coincide with the regular and ongoing groundwater and habitat management activities, i.e., the Covered Activities. Thus, by design and with the TWDB approval of the 2017 Management Plan, the District MP's objectives and performance standards are now aligned with and identical to the District HCP's conservation measures and their performance standards approved by the Service.

A comprehensive, detailed description of the progress, activities and actions taken by the District in the reporting year for each of the HCP objectives and conservation Measures is included in Appendix C of this HCP Annual Report.

The FY 2019 Management Annual Report can also be viewed at:

<https://bseacd.org/uploads/FY-2019-Final-Annual-Report-Audit-and-App-B-12.12.19.pdf>

On December 12, 2019, the District's Board of Directors determined that satisfactory progress had been made in FY 2019 toward all goals and objectives of the Management Plan, using the relevant performance standards for each. The alignment between the HCP Conservation Measures, the Management Plan objectives and their shared performance standards are provided in the Table 9 below.

Table 9. Status and Progress on Management Plan Objectives & Habitat Management Plan Objectives

Teams	General Mgmt. (9 objectives)	Administration (3 objectives)	Education & Outreach (6 objectives)	Aquifer Science (8 objectives)	Reg. Compliance (7 objectives)
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TWDB GOAL 1 - Providing the Most Efficient Use of Groundwater – TWC §36.1071(a)(1) [HCP Measures 6.2.1.1 – Providing Most Efficient Use of Groundwater]			
Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
1-1 (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 <u>annual report</u> . 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 <u>annual report</u> .	MET
1-2 (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 <u>annual report</u> .	MET
1-3 (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 <u>annual report</u> .	MET

1-4 (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 monthly eNews bulletins and continuously on the District website. 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 <u>annual report</u> .	MET
1-5 (NA)	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 <u>annual report</u> . B. Timely develop and approve fiscal-year budgets and amendments. The dates for public hearings and Board approval of the budget and any amendments will be provided in the <u>annual report</u> .	MET
1-6 (NA)	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 <u>annual report</u> . 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 <u>annual report</u> .	MET
1-7 (NA)	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 <u>annual report</u> for years when elections occur.	MET

TWDB GOAL 2 - Controlling and Preventing Waste of Groundwater – TWC §36.1071(a)(2))
[HCP Measures 6.2.1.2 – Controlling and Preventing Waste of Groundwater]

Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
2-1 (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 <u>annual report</u> .	MET

2-2 (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 <u>annual report</u> . 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 <u>annual report</u> .	MET
2-3 (M-5)	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 <u>annual report</u> . In odd-numbered fiscal years, provide a legislative debrief to the 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 <u>annual report</u> .	MET
2-4 (NA)	Ensure all firm-yield production permits are evaluated with consideration given to the Reasonable Use doctrine and 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 <u>annual report</u> .	MET
TWDB GOAL 3 - Addressing Conjunctive Surface Water Management Issues – TWC §36.1071(a)(4) [HCP Measures 6.2.1.3 – Addressing Conjunctive Surface Water Management Issues]			
Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
3-1 (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 <u>annual report</u> .	MET

3-2 (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: <ol style="list-style-type: none"> 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 <u>annual report</u> .	MET
3-3 (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 <u>annual report</u> .	MET
3-4 (NA)	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 <u>annually report</u> on meetings attended.	MET

TWDB GOAL 4 - Addressing Natural Resource Issues which Impact the Use and Availability of Groundwater, and which are Impacted by the Use of Groundwater – TWC §36.1071(a)(5)

[HCP Measures 6.2.1.4 – Addressing Natural Resource Management Issues]

Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
4-1 (4-1)	<p>Assess ambient conditions in District aquifers on a recurring basis by:</p> <ol style="list-style-type: none"> 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; 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. 	<ol style="list-style-type: none"> 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 <u>annual report</u>. 	MET
4-2 (4-2)	<p>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.</p>	<p>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:</p> <ol style="list-style-type: none"> 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. <p>A list of permit applications that are determined to have potential for unreasonable impacts will be provided in the <u>annual report</u>.</p>	MET

4-3 (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 <u>annual report</u> . 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 <u>annual report</u> .	MET
4-4 (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 HCP.	Attend at least 75% of the GMA meetings and annually report on meetings attended, GMA decisions on DFCs, and other relevant GMA business.	MET
4-5 (4-5)	Implement the measures of the District Habitat Conservation Plan (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 <u>annual report</u> . Upon ITP issuance, the <u>HCP annual report</u> documenting the District's activities and compliance with ITP permit requirements will be incorporated into the <u>annual report</u> by reference.	MET
TWDB GOAL 5 - Addressing Drought Conditions – TWC §36.1071(a)(6) [HCP Measures 6.2.1.5 – Addressing Drought Conditions]			
Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
5-1 (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 <u>annual report</u> .	MET

5-2 (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 <u>annual report</u> .	MET
5-3 (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.	<p>A. During District-declared drought, publicize declared drought stages and associated demand reduction targets in monthly eNews bulletins and continuously on the District website.</p> <p>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 <u>annual report</u>.</p>	MET
5-4 (5-4)	<p>Assist and, where feasible, incentivize individual freshwater Edwards Aquifer historic-production permittees in developing drought planning strategies to comply with drought rules, including:</p> <ol style="list-style-type: none"> 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. 	<p>A. Require an updated UCP/UDCP from Permittees within one year of each five-year Management Plan Adoption.</p> <p>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 <u>annual report</u>.</p>	MET

5-5 (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 <u>annual report</u> .	MET
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TWDB GOAL 6 - Addressing Conservation & Rainwater Harvesting where Appropriate and Cost Effective –TWC §36.1071(a)(7)
[HCP Measures - 6.2.1.6 Addressing Demand Reduction through Conservation]

Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
6-1 (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 <u>annual report</u> . B. Publicize declared drought stages and associated demand reduction targets monthly in eNews bulletins and continuously on the District website.	MET
6-2 (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.	<u>On an annual basis</u> , 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.	MET
6-3 (6-3)	Develop and maintain programs that educate and inform District groundwater users and constituents of all ages about water conservation practices and 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 <u>annual report</u> . 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.	MET

TWDB GOAL 7 - Addressing Recharge Enhancement where Appropriate and Cost Effective – TWC §36.1071(a)(7)

[HCP Measures - 6.2.1.7 Addressing Supply through Structural Enhancement]

MP Obj No.	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
7-1 (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 <u>annual report</u> .	MET
7-2 (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, and effluent reclamation and re-use, to increase the options for water-supply substitution and reduce dependence on the Aquifer.	Assess progress toward enhancing regional water supplies in the <u>annual report</u> .	MET

TWDB GOAL 8 - Addressing the Desired Future Conditions of the Groundwater Resources – TWC §36.1071(a)(8)
[HCP Measures - 6.2.1.8 Quantitatively Addressing Established Desired Future Conditions]

Obj. IDs Mgmt. Plan (HCP)	Management Plan Objectives (HCP Minimization Measure)	Performance Standards	Objective Status
8-1 (8-1)	<p>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.</p>	<p>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 <u>annual report</u>.</p> <p>B. Upon ITP issuance, the <u>HCP annual report</u> documenting the District’s activities and compliance with ITP permit requirements will be incorporated into the <u>annual report</u> by reference.</p> <p>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 <u>annual report</u>.</p>	MET
8-2 (8-2)	<p>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).</p>	<p>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 <u>annual report</u>.</p> <p>B. Upon ITP issuance, the <u>HCP annual report</u> documenting the District’s activities and compliance with ITP permit requirements will be incorporated into the <u>annual report</u> by reference.</p> <p>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 <u>annual report</u>.</p>	MET

<p>8-3 (8-3)</p>	<p>Implement appropriate rules and measures to ensure compliance with District-adopted DFCs for each relevant aquifer or aquifer subdivision in the District.</p>	<p>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 <u>annual report</u>. 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 <u>annual report</u>.</p>	<p>MET</p>
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10.0 Mitigation Actions Taken During the Year, and Updates on Any Ongoing Mitigation Measures

In its HCP, the District identified five mitigation measures that it intended to utilize to offset unavoidable take and to otherwise minimize take further. These are characterized in Table 10 below, along with the progress made for each, as of the end of the reporting period.

Most of these mitigation measures require concurrence and/or involvement of other parties, especially the City of Austin (City).

The District and the City finalized and executed an Interlocal Agreement late in the FY 2019 reporting year. This ILA, provided in Appendix B, will be instrumental in more robustly pursuing certain aspects of the mitigation measures in the upcoming years. Several of the activities characterized in Appendix C, describing progress toward the over-arching HCP goals, also relate to preparation for mitigation actions.

Table 10. Summary of Progress on Mitigation Measures

HCP ID No.	HCP Section 6.2.2.2 Mitigation Measures	Progress or Status as of End of FY 2019
M-1	<p>The District commits to supporting the operations of an existing refugium with facilities capable of maintaining backup populations of the Covered Species to preserve the capacity to re-establish the species in the event of the loss of population due to a catastrophic event such as an unexpected cessation of spring flow or a hazardous materials spill that decimates the species habitat. Such supplemental support would be provided through a commitment of in-kind, contracted support, and/or cash contributions that would contribute to:</p> <ul style="list-style-type: none"> a. Continuing the study of salamander physiology and/or behavior, and b. Conserving field and captive populations. 	<p>Under ILA Section VII.E, the City and District agreed that the District would periodically analyze water chemistry of the source water for the refugium. No sampling and analysis were conducted in the reporting year.</p>
M-2	<p>The District, in cooperation with the City, commits to participating in conducting feasibility studies and, as warranted, pilot and implementation projects to evaluate the potential for beneficial subsurface DO augmentation of flow in the immediate vicinity of the spring outlets and improved surface DO augmentation in the outlets (only) during Extreme Drought conditions. In-kind, contracted support, and/or cash contributions, phased during the term of the permit, may be authorized for feasibility studies and, if a project is feasible, for the pilot study and implementation of the augmentation project.</p>	<p>ILA Section VII.A describes the provisions under which these studies will be conducted. No other progress was made in the reporting year.</p>

M-3	<p>The District commits to extending the currently committed time period to operate the Antioch Recharge Enhancement Facility to continue after the 319(h) grant commitments (September 2014 or later), thereby improving recharge water quality and reducing nonpoint-source pollution at the outlets from runoff events during that time.</p>	<p>The facility continues to be operated by the District. Some upgraded controllers were recently installed to ensure more responsive operation during variable creek flow conditions.</p>
M-4	<p>The District commits to establishing a new reserve fund for plugging abandoned wells to eliminate high-risk abandoned wells as potential conduits for contaminants from the surface or adjacent formations into the aquifer, with priority given to problematic wells close to the Barton Springs outlets and/or associated with water chemistry concerns under severe drought conditions. This reserve fund, which like others under state law has restrictions on its funding and use, would be established within the first year after issuance of the ITP by closing the existing Drought Reserve Account, whose stipulated purpose has been legal defense for drought management, and then by utilizing its current balance to initially fund a new Aquifer Protection Reserve Account. The new account would exist solely to fund plugging of abandoned wells and would be replenished after the first year with any collected enforcement penalties, any drought management fees imposed on larger nonexempt permittees that do not meet their drought curtailments, and an annual budgeted supplement at the discretion of the Board.</p>	<p>Implementation of key elements of this measure will require some additional rulemaking and related Board actions, which haven't yet occurred.</p>

<p>M-5</p>	<p>For the term of the ITP, the District commits to provide leadership and technical assistance to other government entities, organizations, and individuals when prospective land-use and groundwater management activities in those entities' purview will, in the District's assessment, significantly affect the quantity or quality of groundwater in the Aquifer. The District will respond actively and appropriately to legislative initiatives or projects that affect Aquifer characteristics, provided such actions are consistent with established District rules, ongoing initiatives, or existing agreements.</p>	<p>The District has been actively engaged in several activities that relate to this mitigation measure during the reporting period:</p> <ul style="list-style-type: none"> • Provided technical assistance to GMA 9 related to designing and deploying DFC monitoring networks • Provided technical assistance to Travis County to study hydrogeology of southwestern Travis County and to conduct community outreach as to benefits of groundwater management in this area • Conducted hydrogeologic investigations at Jacob's Well and served on a technical advisory committee to Wimberley Valley Watershed Association on efficacy of Jacob's Well's management zone • Performed numerous ad hoc, real-time site inspections of karst features revealed by the road construction at major intersections along South MoPac expressway on the Recharge Zone • Assisted City of Austin in evaluating the cause, circumstance, and prevention of discharge of turbid water to the Aquifer in an installation of a closed-loop geothermal well system • Provided testimony on groundwater supplies and regulation to legislative committees conducting interim hearings.
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11.0 An Evaluation of the Effectiveness of the Avoidance, Minimization, and Other Conservation Measures

The District and its permittees responded to the mandatory curtailments specified in their drought management plans in a generally superlative fashion, achieving an average reduction that exceeded the reductions required to meet the targeted volumes (see Section 7 above). The sustained DO concentrations at the spring outlets have generally been similar to those expected on the basis of the spring flow volumes, which confirms the basis and expected effectiveness for the requisite pumpage reductions for the drought periods.

The City reports in its most recent HCP annual report that while the salamander populations remained stable through this reporting period, the overall low abundance, especially for the reporting period compared to immediately prior years, may be a reflection of reduced recruitment and reproduction during the stressful 2008 drought period, but it also may be within the norms of variability in abundance of such a small population (City of Austin, 2018 Annual Report to Fish and Wildlife Service, January 2019).

As noted in Section 9 above, the District's Board of Directors determined that satisfactory progress was made in FY 2019 toward all HCP/MP goals and objectives, using the relevant performance standards for each.

12.0 Adaptive Management Activities Undertaken During the Year, or Indicated as Prudent by Outcomes of the Conservation Program

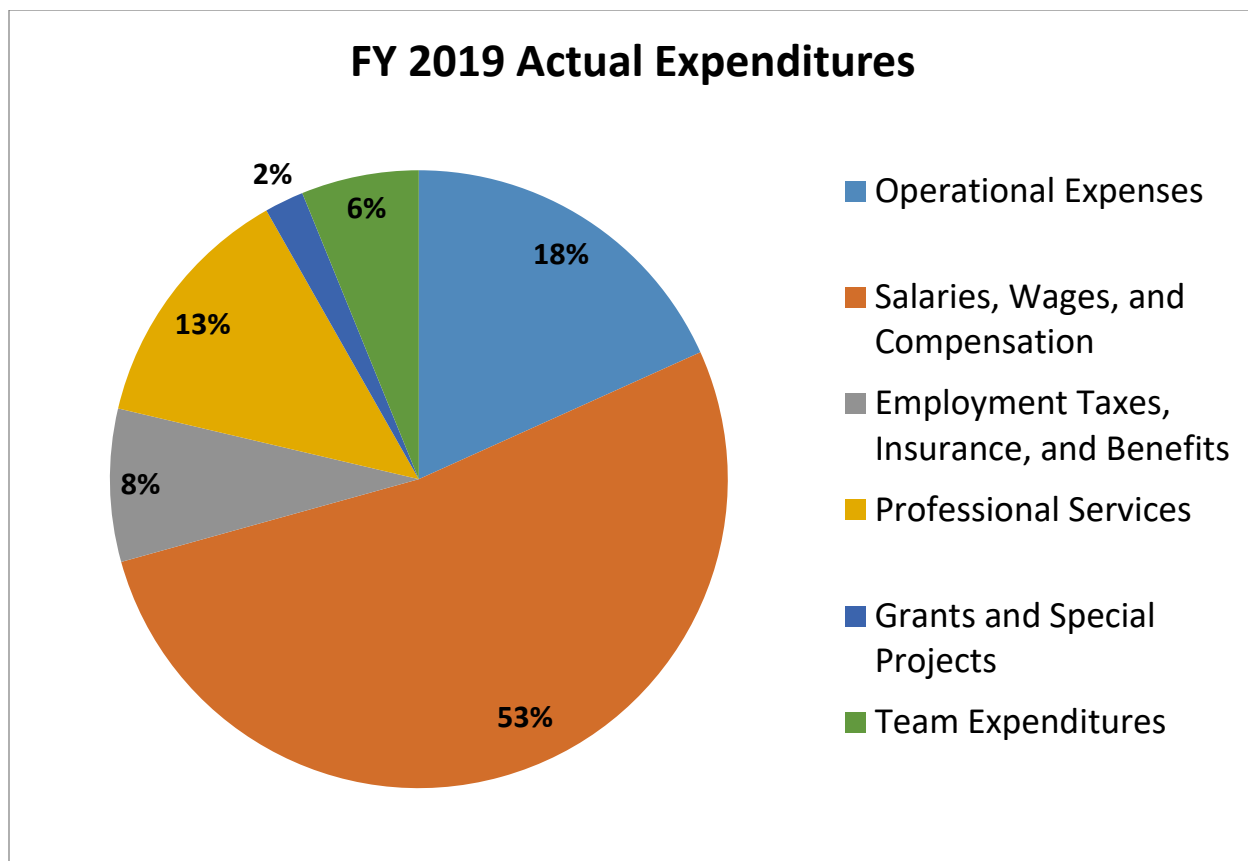
This reporting period was the first one for the District's ITP. No adaptive management activities were identified as needed, and none were undertaken.

13.0 Expenditures by BSEACD on Implementation Activities

By approval of the Management Plan Annual Report, the District's Board of Directors warrants that there were no fiscal year 2019 expenses incurred that were not directly or indirectly related to the execution of this HCP, other than \$10,440 in reimbursable expenses that was removed from the total fiscal year 2019 expense amount, and that reduction was accounted for and is not included in the total expenses shown on the accompanying pie chart.

Therefore, 100% of the District expenses shown on the accompanying pie chart were considered HCP expenses, and satisfies the minimum commitment funding of no less than 60% of each year's annual budget.

The District's HCP implementation, which integrates the conservation measures and the District's groundwater management program, expended a total of \$1,904,421.00 in FY 2019. The breakdown of these expenses is shown in Figure 8 below.



FY 2019 ACTUAL EXPENDITURES			
A.	Operational Expenses	\$347,774	18.26%
B.	Salaries, Wages, and Compensation	\$998,320	52.42%
C.	Employment Taxes, Insurance, and Benefits	\$152,265	8.00%
D.	Professional Services	\$249,666	13.11%
F.	Grants and Special Projects	\$39,147	2.06%
E.	Team Expenditures	\$117,249	6.16%
		\$1,904,421	100.00%

Figure 8. FY 2019 Actual Expenditures.

14.0 Any Species-specific or Aquifer Research Compiled or Completed During the Prior Year

The District did not conduct species-specific research in the reporting period. It continues to monitor the ongoing salamander-related studies and assessments by the City, as documented in its own HCP Annual Report. At this time, no additional cooperatively-funded, species-specific research needs have been identified.

Most of the District's hydrogeologic research in the reporting period was focused on the Trinity Aquifer and in areas outside the ITP Area. However, inasmuch as the Trinity is directly or indirectly hydrologically connected to the Barton Springs segment of the Edwards and improved knowledge of the Trinity Aquifer supports decision-making for managing the Edwards, such research is relevant to the HCP. Published papers and District documents from FY19 are listed below. The publication by Hunt et al., 2019 is the current state of knowledge of the hydrogeology of the Barton Springs segment of the Edwards Aquifer.

- Hunt, B.B., Smith, B.A., and Hauwert, N.M., 2019, Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer, central Texas, in Sharp, J.M., Jr., Green, R.T., and Schindel, G.M., eds., The Edwards Aquifer: The Past, Present, and Future of a Vital Water Resource: Geological Society of America Memoir 215, p. 75-100, <https://pubs.geoscienceworld.org/books/book/2156/The-Edwards-Aquifer-The-Past-Present-and-Future-of>
- Gary, M.O., Hunt, B.B., Smith, B.A., Watson, J.A., and Wierman, D.A., 2019, Evaluation for the Development of a Jacob's Well Groundwater Management Zone Hays County, Texas. Technical Report prepared for the Hays Trinity Groundwater Conservation District, Hays County, Texas. Meadows Center for Water and the Environment, Texas State University at San Marcos, TX. Report: 2019-05. July 2019. 58 p. https://bseacd.org/uploads/JW-Mgmt-Zone-Report_7.30.19.pdf
- Smith, B.A., and Hunt, B.B., 2019, Multilevel monitoring of the Edwards and Trinity Aquifers, in Sharp, J.M., Jr., Green, R.T., and Schindel, G.M., eds., The Edwards Aquifer: The Past, Present, and Future of a Vital Water Resource: Geological Society of America Memoir 215, p. 293-298, <https://pubs.geoscienceworld.org/books/book/2156/The-Edwards-Aquifer-The-Past-Present-and-Future-of>
- Hunt, Brian B., Brian A. Smith, Robin Gary, and Justin Camp, 2019, March 2018 Potentiometric Map of the Middle Trinity Aquifer, Central Texas. BSEACD Report of Investigations 2019-0109. 28 p. https://bseacd.org/uploads/BSEACD_RI_2019-0109_PotMap_FINAL.pdf
- Smith, B.A., B.B. Hunt, D.A. Wierman, and M.O. Gary, 2018, Groundwater Flow Systems of Multiple Karst Aquifers of Central Texas. In I.D. Sasowsky, M.J. Byle, and L. Land (Eds). Proceedings of the 15th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst and the 3rd Appalachian Karst Symposium, National Cave and Karst Research Institute (NCKRI) Symposium 6, p 17-29. <https://bseacd.org/uploads/Smith-et-al.-2018-GW-Flow-Systems-in-Multiple-Karst-Aquifers-Sinkhole-Conference.pdf>
- Smith B.A., Hunt B.B., 2018, Recharge and Water-Quality Controls for a Karst Aquifer in Central Texas. In: White W., Herman J., Herman E., Rutigliano M. (eds) Karst Groundwater Contamination and Public Health. Advances in Karst Science. Springer. https://link.springer.com/chapter/10.1007/978-3-319-51070-5_35
- Cockrell, L., B.B. Hunt, R. Gary., B.A. Smith, 2018, Regional Geologic Geodatabase Project, Central Texas. Barton Springs Edwards Aquifer Conservation District. Data Series Report 2018-1211. December 2018. 14 p. https://bseacd.org/uploads/Cockrell-et-al.-2018_Geology_Geodatabase.pdf
- Wierman, D.A., B.B. Hunt, 2018, Groundwater Level Monitoring Results for HTGCD Transducer Wells and Wimberley Valley Public Water Supply Wells, Hays County, TX. Meadows Center for

Water and the Environment, Texas State University at San Marcos, TX.

https://bseacd.org/uploads/Wierman-and-Hunt-2018-TSU-Water-Levels_revised.pdf

- Hunt, B.B., B.A. Smith, and J. Camp, 2018, Is the BSEACD's Drought Trigger Methodology Representative of the Middle Trinity Aquifer?. BSEACD Technical Memo 2018-0829. August 2018. 12 p. https://bseacd.org/uploads/BSEACD_Tech-Note-2018-0829_DTM-MiddleTrinity.pdf
- Hunt, B.B., B.A. Smith, and J. Camp, 2018, Dye Trace at Raccoon Cave near Jacob's Well Spring, Hays County, Texas. BSEACD Technical Memo 2018-0831. August 2018. https://bseacd.org/uploads/BSEACD_techmemo_2018_0831_JWS_dyetrace.pdf
- Watson, J., A.S. Broun, B.B. Hunt, B.A. Smith, D.A. Johns, J. Camp, and D.A. Wierman, 2018, Summary of Findings: Upper Onion Creek Dye Trace, Hays County, Texas, Winter 2017. Interagency Memo. May 18, 2018. 19 p. http://bseacd.org/uploads/Upper-Onion-trace-memo_05182018.pdf
- Watson, J.A., A.S. Broun, B. B. Hunt and D.A. Wierman, 2018, Geologic Mapping of the Upper Glen Rose Unit 3 (Lower Cretaceous) in the Onion Creek Basin, Western Hays County, Texas: Implications for Recharge to the Trinity Aquifer. GCAGS Journal, v. 7 (2018), p. 107–120. https://bseacd.org/uploads/Watson.et_al2018.GCAGS_Journal.v7.07.p107-120.pdf
- Hunt, B.S. Smith, B.A., Gary, M.O., Watson, J., Broun, A., Wierman, D.A., and Fieseler, R., 2018, Technical Review and Comments: Conceptual Model Update for the Hill Country Portion of the Trinity Aquifer. Letter dated August 31, 2018. 22 p. (comments at end of the GAM report in link below) http://www.twdb.texas.gov/groundwater/models/gam/trnt_h/ConceptualModelReport.pdf?d=4146.700000001147

15.0 Proposed Activities for Next Year

Activities proposed to take place next year generally relate to a continuation of those organizational activities necessary to have the District meet its ongoing obligations as a GCD and its current commitments, as well as its planned direct and indirect groundwater management initiatives. In prospect, some of these include:

- Completion of the Southwest Travis County ILA Project
- Continuation of model development to support evaluations of Trinity aquifer
- Continuation of Trinity Sustainable Yield project
- Continuation of two contested case/legal challenges associated with controversial permit applications in the Shared Territory – Electro Purification, and Needmore
- Completion of Intera database project
- Installation of Hays County monitor wells
- Utilization of contractual support associated with various technical and professional services, including:
 - technical services to support prospective special projects including ASR pilot projects, continued aquifer characterization, new monitor well installation, and HCP-related projects;
 - technical and consulting services to support prospective implementation of the HCP including initial annual reporting and mitigation measures; and

- engineering services associated with continued monitoring and review of major roadway projects including SH 45 SW.

Even if certain ones of these are not directly or indirectly related to the HCP, they will affect the financial resources that will be available to conduct special projects. However, none of these prospective activities will impede the implementation of work to comply with the HCP.

16.0 Recommendations for Improvement

The District has not identified any changes needed to improve the implementation of the HCP or compliance with the ITP provisions at this time.

The Validation Monitoring Program (specified in HCP Section 6.3.1, and included in this Annual Report in Appendix A) anticipates that eventually there could be an improved take estimate protocol for future use, based on then-new information and/or analyses concerning gaged springflows, water chemistry, and salamander counts. These characteristics form the basis for the take estimate methodology. In the current reporting period, which is the first one for this ITP/HCP, the District has not identified any new information or analysis that would indicate the basis of the take estimate methodology needs to be modified.

17.0 Any Other Appropriate Information Documenting Compliance with the Permit

None required.

Appendix A - Description of District's Validation Monitoring Protocol

Appendix B - Interlocal Agreement between the District and City of Austin

Appendix C - Assessment of Progress in FY2019 Toward Plan Goals and Objectives (Management Plan Annual Report FY 2019 – Appendix B)

Appendix D - Meeting Minutes (1/28/2020) of Management Advisory Committee