Wintergarden Groundwater Conservation District Groundwater Management Plan

Adopted by the Wintergarden Groundwater Conservation District Board of Directors on August 4, 2026

TEXAS WATER DEVELOPMENT BOARD approval on [_____], 2026

The Wintergarden Groundwater Conservation District Office is located at:

2881 Hwy. 277 West
P. O. Box 1433
Carrizo Springs, TX 78834

Telephone: (830) 876-3801
Fax: (830) 876-3782
E-mail: wgcd@wgcd.net

Office Hours: 8:00 a.m. - 12:00 noon, 1:00 p.m. - 5:00 p.m.

Table of Contents

APPENDICES

I. DISTRICT MISSION

The mission of the Wintergarden Groundwater Conservation District (the "**District**") is, as stated in Texas Water Code Section 36.0015(b), to manage groundwater in order to protect property rights, balance the conservation and development of groundwater to meet the needs of the citizens of the District, and use best available science in the conservation and development of groundwater through rules developed, adopted, and promulgated by the District in accordance with the powers and duties conferred under Chapter 36 of the Texas Water Code and other applicable law. In doing so, the District will work to protect the existing and historic use of groundwater and give consideration to the needs of the agricultural community within the District, while also working to (a) minimize the further drawdown of water levels to the extent reasonably possible in light of drought and other factors, (b) prevent the waste of groundwater, (c) prevent interference between groundwater wells, (d) prevent the degradation of the quality of groundwater resources, and (e) use public education to promote water conservation, Any action taken by the District shall be only after full consideration and respect has been afforded to the individual property rights of all citizens of the District. The statements in this Part I shall be referred to collectively as the "**District's Mission**."

II. PURPOSE OF THE GROUNDWATER MANAGEMENT PLAN

The purpose of the District's management plan (the "**Management Plan**") is to provide a planning tool for the District as it works to achieve the District's Mission. This Management Plan currently contains the hydrogeological and technical information provided by the Texas Water Development Board ("**TWDB**") regarding the groundwater resources of the District. As the District obtains more site-specific groundwater information, the District will update and amend this Management Plan, as necessary.

The development of the Management Plan will enable the District to comply with the requirements of state law. The Texas Legislature created a statewide water planning process with the passage of Senate Bill 1 in 1997 ("**SB 1**"), Senate Bill 2 in 2001 ("**SB 2**"), and Senate Bill 3 in 2007 ("**SB 3**"). The development of management plans by each groundwater conservation district ("**GCD**") in Texas is an integral part of the statewide water planning process. The Management Plan satisfies all the requirements established for GCDs by SB 1, SB 2, SB 3, HB 1763, the requirements of Chapter 36 of the Texas Water Code ("**Chapter 36**"), and the requirements of the rules of the TWDB.

III. DISTRICT INFORMATION

A. Creation of the District

The District was created in 1997 by the 75th Legislature with the enactment of House Bill 3602 (included as "Appendix A"). In its enabling legislation, the District was provided the powers and duties provided by the general law of the state of Texas that is applicable to GCDs created under Section 59, Article XVI of the Texas Constitution, which includes Chapter 36. The District was confirmed by election in January 1998. The initial tax rate was $0.04 per $100.00 valuation. The District's current tax rate is $0.00425 per $100.00 valuation. The District retains the authority and responsibilities specified in its enabling act, Chapter 36, the TWDB rules, this Management Plan, and the District's rules, as they may be amended from time to time (the "**Rules**").

B. Board of Directors

The District's board of directors (the "**Board**") is made up of seven (7) members. Two (2) directors are elected from each of the three (3) counties within the District—Dimmit, Zavala and La Salle counties—in addition to one (1) director at large from within the District's boundaries. Board members serve staggered terms, and Board elections occur every two (2) years.

C. Legal Authority

The District has the rights and responsibilities provided for in Texas Water Code Chapter 36 and 31 Texas Administrative Code Chapter 356. The District exercises these rights and fulfills these responsibilities through the adoption and implementation of rules (the "**District Rules**").

D. Location and Extent of District Boundaries

The boundaries of the District are coextensive with the boundaries of Zavala, Dimmit and La Salle counties. This geographic area includes approximately 2,685,148 acres, or 4,195 square miles. A map showing the District boundaries is contained in "Appendix B".

E. Groundwater Resources of District

The aquifers within the District include the Sparta, Queen City, Carrizo-Wilcox, and Yegua-Jackson aquifers. The Carrizo Sand unit within the Carrizo-Wilcox Aquifer (the "**Carrizo Sand**") is the principal source of groundwater in Dimmit, La Salle, and Zavala counties, supplying large quantities of water to groundwater wells ("**Wells**") throughout the District. The primary use of Carrizo Sand groundwater within the District is for irrigation, municipal use, and oil and gas activities. The Carrizo Sand outcrops in a belt extending from the Rio Grande River through the western part of Dimmit County to the Zavala County line. In the vicinity of the Carrizo Springs anticline, west and southwest of the City of Carrizo Springs, the outcrop has a maximum width of about nine (9) miles, narrowing again to about two (2) miles at the Zavala County line. The Carrizo Sand consists of beds of massive, commonly cross-bedded, loosely cemented, remarkably clean

sand and some minor amount of sandstone and clay. The average thickness of the Carrizo Sand in Dimmit County is about 265 feet; however, the thickness ranges from zero feet at the outcrop to a maximum of 360 feet. See Texas Board of Water Engineers, Bulletin 6003, Geology and Ground-Water Resources of Dimmit County, TX 1960.

Dimmit County

In Dimmit County, water levels of the Carrizo Sand and the depths of Wells tapping into the Carrizo Sand fluctuate in response to changes in groundwater storage and changes in artesian pressure. Water recharging the Carrizo Sand in the outcrop tends to make groundwater levels rise, whereas withdrawals from Wells tend to make groundwater levels decline. The Carrizo Sand contains groundwater of generally good quality.

The Wilcox Group portion of the Carrizo-Wilcox Aquifer (the "**Wilcox Group**"), comprised of the Simsboro and Calvert Bluff formations, contains groundwater of acceptable quality, but the Wilcox Group is not as prolific as the Carrizo Sand. As one moves easterly in the District, the Wilcox Group is deeper and the groundwater quality degrades.

La Salle County

Based on Texas Water Commission Bulletin 6520, August 1965, the Carrizo Sand is, by far, the largest potential source of groundwater in La Salle County. The chemical quality of groundwater from Wells in La Salle ranges from fresh to moderately saline. The Carrizo Sand contains the largest quantity of fresh to slightly saline groundwater in La Salle County. According to Bulletin 6520, yields of up to 1,000 GPM might be obtained from the Queen City Aquifer in much of La Salle County. The Sparta Aquifer probably is capable of yielding as much as 400 GPM to Wells in the western two-thirds of La Salle County. The Queen City Aquifer and Sparta Aquifer contain groundwater that is likely unsuitable for irrigation. However, the groundwater from the Sparta Aquifer, especially above a depth of about 100 feet, is of better quality than the groundwater from the Queen City Aquifer. Other geologic formations in La Salle County are capable of yielding only small quantities of groundwater, and most of the groundwater is saline. There is minor pumping of the Yegua-Jackson Aquifer in La Salle County.

Zavala County

The primary source of usable groundwater in Zavala County is the Carrizo-Wilcox Aquifer. The Yegua-Jackson Aquifer is not present in Zavala or Dimmit counties. According to published reports, the Leona Formation, which is limited in thickness, has been a source of irrigation groundwater in Zavala County. See U.S. Department of the Interior-Texas Board of Water Engineers; Geology and Groundwater Resources of the Winter Garden District, Texas, 1948.

IV. Criteria for Plan Approval

A. Planning Horizon

The Management Plan is adopted to be effective for a five (5) year planning period, which will begin on the date TWDB approves this Management Plan. In accordance with Section 36.1072(e) of the Texas Water Code and TWDB rules (in 31 TAC Chapter 356), the District will review and re-adopt its Management Plan with or without amendments, every five (5) years and will re-submit its Management Plan for TWDB approval after re-adoption. This Management Plan will be effective until replaced by a revised plan that has been approved by the TWDB.

B. Documentation of Plan Adoption

Public notices demonstrating that this Management Plan was adopted after the required public hearing and Board meeting along with a copy of the posted agenda and meeting minutes are attached to this plan as "Appendix C".

A certified copy of the resolution of the Board adopting this Management Plan is attached to this plan as "Appendix D".

C. Documentation of Coordination with Surface Management Entities

Letters transmitting copies of this Management Plan to the Nueces River Authority and the Region L Regional Water Planning Group are located in "Appendix E".

V. Groundwater Management Plan Data (31 TAC 356.52(a)(6)-(7); Tex. Water Code 36.1071(e)(3) – (4))

In developing this Management Plan, the District considered each of the following, which are incorporated into and made a part of the Management Plan:

A. Modeled Available Groundwater Amounts/Estimates (31 TAC356.52(a)(6)(A))

Modeled available groundwater ("**MAG**") is defined in Texas Water Code § 36.001(25) as "the amount of water that the Executive Administrator [TWDB] determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108." The TWDB uses a groundwater availability model, ("**GAM**"), which includes Dimmit, La Salle, and Zavala Counties to determine MAGs applicable to the District. Under Texas Water Code § 36.108(d), the desired future condition ("**DFC**") may only be determined through joint planning with other GCDs in the same groundwater management area ("**GMA**"). The District is located in GMA-13. The proposed DFCs must be approved and adopted by a two-thirds vote of all district representatives in GMA-13. Section 36.108(d-3). GMA-13 is currently in the process of proposing and adopting new DFCs; new DFCs will be adopted no later than January 5, 2027. After adoption, the District will update its Management Plan to reflect the new DFCs. GMA-13's current DFCs are described below.

As set forth in DFC Resolution 21-02, attached as "Appendix F", the district members of GMA-13 identified the following DFCs:

The desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers described in Resolution 21-02 from Groundwater Management Area 13, adopted November 19, 2021 are:

- "The first proposed desired future condition for the Carrizo-Wilcox, Queen City and Sparta aquifers in Groundwater Management Area 13 is that 75 percent of the saturated thickness in the outcrop at the end of 2012 remains in 2080. Due to the limitations of the current Groundwater Availability Model, this desired future condition cannot be simulated as documented during 2016 Joint Planning in GMA 13 Technical Memorandum 16-08"
- "In addition, a secondary proposed desired future condition for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 is an average drawdown of 49 feet (+/- 5 feet) for all of GMA 13. The drawdown is calculated from the end of 2012 conditions to the year 2080. This desired future condition is consistent with simulation "GMA13_2019_001" summarized during a meeting of Groundwater Management Area 13 members on March 19, 2021."Subsequent technical guidance from GMA-13 clarified two important parameters for implementing these DFCs. In GAM Run 21-018, GMA-13's Technical Coordinator confirmed that the end of 2011

— not the end of 2012 — serves as the reference year for drawdown calculations for the Carrizo-Wilcox, Queen City, and Sparta aquifers.

The desired future conditions for the Yegua-Jackson Aquifer described in Resolution 21-03 from Groundwater Management Area 13, adopted November 19, 2021 are:

- "For Gonzales County, the average drawdown from 2010 to 2080 is 3 feet (+/- 1 foot)."
- "For Karnes County, the average drawdown from 2010 to 2080 is 1 foot (+/- 1 foot)."
- "For all other counties in GMA 13, the Yegua-Jackson is classified as not relevant for purposes joint planning."

The Edwards (Balcones Fault Zone), Gulf Coast, and Trinity aquifers were declared not relevant for purposes of joint planning by Groundwater Management Area 13 in Resolution 21-01.

The MAG report provided by the TWDB "GAM Run 21-018 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson Aquifers in Groundwater Management Area 13" dated July 25, 2022, based on the DFCs is attached as "Appendix G".

B. Estimated Historical Water Use Data (31 TAC 356.52(a)(6)(B); 356.10(3))

Estimated historical water use from the TWDB Historical Water Use Survey for the years 2014 through 2023 is provided for Dimmit, La Salle, and Zavala Counties in the "Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District," dated May 2, 2026, attached as "Appendix H".

C. Estimated Amount of Annual Recharge from Precipitation to Each Aquifer (31 TAC 356.52(a)(6)(C))

The estimated annual amount of recharge from precipitation to the groundwater resources within the District is provided in the "GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan" dated September 30, 2020, attached as "Appendix I".

D. Estimated Annual Amount of Water that Discharges from Each Aquifer (31 TAC 356.52(a)(6)(D))

The estimated annual volume of water that discharges from the aquifer to springs and any surface-water bodies, including lakes, streams, and rivers for each aquifer within the District is provided in the "GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan" dated September 30, 2020, attached as "Appendix I".

E. Estimated Groundwater Budget (31 TAC 356.52(a)(6)(E))

The estimated annual volume of flow into and out of the District within each aquifer and between aquifers in the District is provided in the "GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan" dated September 30, 2020, attached as "Appendix I".

F. Projected Surface Water Supplies (31 TAC 356.52(a)(6)(F))

Projected surface water supplies pursuant to the TWDB 2022 State Water Plan data is provided in the "Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District" dated May 2, 2026, attached as "Appendix H".

G. Projected Total Water Demand (31 TAC 356.52(a)(6)(G))

An estimate of the projected total demand for water within the District according to the most recently adopted state water plan is provided in the "Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District" dated May 2, 2026, attached as "Appendix H".

H. District's Consideration of Projected Water Supply Needs (Tex. Water Code 36.1071(e)(4), 31 TAC 356.52(a)(7)(A))

The projected water supply needs for the District from the adopted state water plan is provided in the "Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District" dated May 2, 2026, attached as "Appendix H". The District considered water supply needs across all three counties and all applicable water user groups (WUGs), including municipal, irrigation, livestock, mining, and manufacturing use categories.

As shown in the table below, irrigation is the dominant unmet need across the planning horizon. Zavala County carries the largest projected supply need, driven almost entirely by irrigation, which is projected at approximately 21,235 acre-feet of unmet need in 2020, remaining above 19,800 acre-feet through 2070. Dimmit County has a combined projected need of approximately 9,473 acre-feet in 2020, declining to about 5,330 acre-feet by 2070, with irrigation and mining as the primary deficit categories. Mining needs in Dimmit are projected to decrease significantly as the planning period progresses, with a small surplus anticipated by 2070. La Salle County has a projected need of approximately 5,272 acre-feet in 2020, declining to 1,441 acre-feet by 2070, again driven by irrigation and mining. Most municipal WUGs — including Asherton, Big Wells, Carrizo Hill WSC, Carrizo Springs, Cotulla, Encinal WSC, and Crystal City — are projected to have adequate supply or small surpluses through much or all of the planning period. Livestock use shows no projected supply need in any county. The following are the specific datasets the District considered:

DIMMIT COUNTY *All values are in acre-feet*

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	ASHERTON	NUECES	0	0	0	0	0	0
L	BIG WELLS	NUECES	0	0	0	0	0	0
L	CARRIZO HILL WSC	NUECES	0	0	0	0	0	0
L	CARRIZO SPRINGS	NUECES	0	0	0	0	0	0
L	COUNTY-OTHER, DIMMIT	NUECES	51	36	30	19	9	0
L	COUNTY-OTHER, DIMMIT	RIO GRANDE	1	1	0	0	0	0
L	IRRIGATION, DIMMIT	NUECES	-4,636	-4,636	-4,636	-4,636	-4,636	-4,636
L	IRRIGATION, DIMMIT	RIO GRANDE	-613	-613	-613	-613	-613	-613
L	LIVESTOCK, DIMMIT	NUECES	0	0	0	0	0	0
L	LIVESTOCK, DIMMIT	RIO GRANDE	0	0	0	0	0	0
L	MINING, DIMMIT	NUECES	-3,570	-3,647	-3,075	-1,769	-464	142
L	MINING, DIMMIT	RIO GRANDE	-654	-665	-577	-375	-175	-81
Sum of Projected Water Demands (acre-feet)			**-9,473**	**-9,561**	**-8,901**	**-7,393**	**-5,888**	**-5,330**

LA SALLE COUNTY *All values are in acre-feet*

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	COTULLA	NUECES	1,090	989	893	776	670	570
L	COUNTY-OTHER, LA SALLE	NUECES	0	0	0	0	0	0
L	ENCINALWSC	NUECES	81	66	52	34	16	0
L	IRRIGATION, LA SALLE	NUECES	-1,184	-1,203	-1,223	-1,248	-1,271	-1,294
L	LIVESTOCK, LA SALLE	NUECES	0	0	0	0	0	0
L	MINING, LA SALLE	NUECES	-4,088	-4,243	-3,734	-2,290	-851	-147
Sum of Projected Water Demands (acre-feet)			**-5,272**	**-5,446**	**-4,957**	**-3,538**	**-2,122**	**-1,441**

ZAVALA COUNTY *All values are in acre-feet*

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Batesville WSC	NUECES	0	0	0	0	0	0

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	COUNTY-OTHER, ZAVALA	NUECES	117	98	75	51	30	9
L	CRYSTAL CITY	NUECES	753	598	456	296	143	0
L	IRRIGATION, ZAVALA	NUECES	-21,235	-21,350	-21,109	-20,733	-20,148	-19,865
L	LOMA ALTA CHULA VISTA WATER SYSTEM	NUECES	0	0	0	0	0	0
L	LIVESTOCK, ZAVALA	NUECES	0	0	0	0	0	0
L	MANUFACTURING, ZAVALA	NUECES	0	0	0	0	0	0
L	MINING, ZAVALA	NUECES	0	0	0	0	0	0
L	ZAVALA COUNTY WCID #1	NUECES	860	813	770	724	680	639
Sum of Projected Water Demands (acre-feet)			**-21,235**	**-21,350**	**-21,109**	**-20,733**	**-20,148**	**-19,865**

I. District's Consideration of Water Management Strategies (Tex. Water Code 36.1071(e)(4), 31 TAC 356.52(a)(7)(B))

The water management strategies from the adopted state water plan are provided in the "Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District" dated May 2, 2026, attached as "Appendix H". The sole water management strategy identified for the District in the 2022 State Water Plan is **municipal water conservation** through demand reduction, applied across all three counties. No irrigation, mining, livestock, or groundwater-specific management strategies are included in the current State Water Plan for the District.

In Dimmit County, municipal water conservation strategies are projected for Asherton, Big Wells, Carrizo Hill WSC, Carrizo Springs, and County-Other, with Carrizo Springs representing the largest projected reduction — growing from 77 acre-feet in 2020 to 784 acre-feet by 2070. In La Salle County, conservation strategies apply to Cotulla, Encinal WSC, and County-Other, with totals increasing from 75 acre-feet in 2020 to 819 acre-feet by 2070. In Zavala County, strategies cover Batesville WSC, County-Other, Crystal City, Loma Alta Chula Vista Water System, and Zavala County WCID 1, with totals growing from 105 acre-feet in 2020 to 1,156 acre-feet by 2070.

The District notes that the state water plan strategies are limited to municipal demand reduction and do not address the irrigation supply needs that represent the largest projected deficit in the District, particularly in Zavala County. The District will continue to evaluate and develop additional local management strategies, including groundwater conservation rules, monitoring,

and coordination with agricultural users, to address needs not covered by the current state water plan. The District specifically considered the following datasets:

DIMMIT COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
ASHERTON, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [DIMMIT]	7	24	47	57	65	72
		7	**24**	**47**	**57**	**65**	**72**
BIG WELLS, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [DIMMIT]	3	2	2	4	7	11
		3	**2**	**2**	**4**	**7**	**11**
CARRIZO HILL WSC, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [DIMMIT]	2	10	11	14	17	20
		2	**10**	**11**	**14**	**17**	**20**
CARRIZO SPRINGS, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [DIMMIT]	77	210	346	498	645	784
		77	**210**	**346**	**498**	**645**	**784**
COUNTY-OTHER, DIMMIT, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [DIMMIT]	0	0	0	0	0	2
		0	**0**	**0**	**0**	**0**	**2**
Sum of Projected Water Management Strategies (acre-feet)		**89**	**246**	**406**	**573**	**734**	**889**

LA SALLE COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
COTULLA, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [LA SALLE]	67	180	303	443	589	737
		67	**180**	**303**	**443**	**589**	**737**
COUNTY-OTHER, LA SALLE, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [LA SALLE]	0	0	0	0	0	5
		0	**0**	**0**	**0**	**0**	**5**
ENCINAL, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [LA SALLE]	8	25	44	58	68	77
		8	**25**	**44**	**58**	**68**	**77**
Sum of Projected Water Management Strategies (acre-feet)		**75**	**205**	**347**	**501**	**657**	**819**

ZAVALA COUNTY

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

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
BATESVILLE WSC, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [ZAVALA]	5	13	16	22	29	37
		5	**13**	**16**	**22**	**29**	**37**
COUNTY-OTHER, ZAVALA, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [ZAVALA]	4	4	4	4	4	4
		4	**4**	**4**	**4**	**4**	**4**
CRYSTAL CITY, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [ZAVALA]	60	196	353	496	573	654
		60	**196**	**353**	**496**	**573**	**654**
LOMA ALTA CHULA VISTA WATER SYSTEM,, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [ZAVALA]	12	34	57	84	112	140
		12	**34**	**57**	**84**	**112**	**140**
ZAVALA COUNTY WCID #1, NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [ZAVALA]	24	24	24	24	24	24
		24	**24**	**24**	**24**	**24**	**24**
Sum of Projected Water Management Strategies (acre-feet)		**105**	**317**	**554**	**794**	**971**	**1,156**

J. Explanation of District's Monitoring of the Achievement of DFCs (Tex. Water Code 36.1071(e)(5)(A))

A groundwater monitoring well observation network has been established to be maintained by the District in order to monitor changing groundwater levels in the Carrizo-Wilcox and Queen City aquifers within the District. The names and locations of the fourteen (14) wells currently in the District's Monitoring Well Network (the "**Monitoring Well Network**") are listed in Table 1 and mapped in Figure 1, which are both included as "Appendix J."

The District monitors groundwater levels in wells completed within the Carrizo-Wilcox Aquifer in Dimmit, La Salle, and Zavala Counties. The District's Monitoring Well Network currently consists of thirteen (13) active wells in Carrizo-Wilcox Aquifer system and one (1) well in the Queen City Aquifer (West Wind). Five (5) wells are equipped with telemetry instrumentation that transmits water-level measurements on a regular basis and is accessible to the public through the District's website. The remaining wells are measured manually by District staff on a periodic basis. Four (4) wells are designated as Drought Index Wells and are used to evaluate drought conditions and trigger drought response stages within the District.

Four of the monitoring wells —Barrier, SW Carrizo, Shape, and Rutledge — are located within the Carrizo-Wilcox outcrop zone. These wells are monitored with respect to the primary GMA-13 DFC, which requires that 75 percent of the saturated thickness present at the end of 2012 remain at the end of 2080. The remaining nine (9) confined-zone wells are monitored with respect to the secondary GMA-13 DFC, expressed as average drawdown in feet.

The District compiles groundwater level data from the Monitoring Well Network to compare current drawdown trends to the GMA-13 DFCs. For the confined zone, the linear trend rates (expressed in feet per year) for each well, using data collected from December 31, 2011 to the present, are used for comparison with the trend representing the adopted DFCs. The per-well trend rates are then summarized as a network-wide average and median statistic. Both statistics are reported because the average is sensitive to extreme values while the median provides a central value for the reported measurements.

For the average drawdown analysis, wells that are no longer actively monitored are excluded from the combined network statistics since they do not provide current information. In addition, telemetry enabled wells are excluded as they only reflect conditions from 2023 onwards. The network-wide average and median trend rates are compared against the annual DFC drawdown rate derived from the adopted Desired Future Condition in GMA-13. The annual DFC rate is calculated by dividing the adopted DFC, expressed as total average drawdown in feet over the 69-year planning horizon.

For the four wells located within the outcrop zone, saturated thickness is calculated as the difference between the groundwater elevation and the base elevation of the Carrizo-Upper Wilcox aquifer layer at each well location. Base elevations for each outcrop well were derived from the GMA-13 Southern Carrizo-Wilcox MODFLOW GAM. Saturated thickness at the end of 2012 was

estimated subtracting the Carrizo-Wilcox aquifer base elevation from the end of 2012 groundwater elevation value. The primary DFC compliance threshold is 75 percent of that 2012 baseline saturated thickness.

K. Explanation of District's Performance in Achieving DFCs in Previous Joint Planning Period (Tex. Water Code 36.1071(e)(5)(B))

During the preceding joint planning period, the District has expanded its Monitoring Well Network by adding telemetry instrumentation to six (6) wells which provides continuous, publicly accessible water-level records. The District also publishes quarterly monitoring reports and interactive historical charts for all telemetry enabled wells, improving transparency and the availability of data for DFC tracking purposes.

Based on current trend statistics for the measured well data, groundwater level is declining at a rate that exceeds the annual secondary DFC decline rate. The GMA-13 secondary DFC for the confined zone of the Carrizo-Wilcox, Queen City and Sparta Aquifer is 49 feet of average drawdown (±5 feet) over the 69-year period from the end of 2011 through the end of 2080, corresponding to an annual average drawdown rate of approximately −0.71 ft/yr. The current average trend rate across the non-telemetry active confined-zone monitoring wells is −6.27 ft/yr, and the current median trend rate is −5.74 ft/yr. The following table summarizes the current network trends relative to the annual DFC rate.

Aquifer	GMA-13 DFC (ft avg. drawdown, 2011–2080)	Annual DFC Rate (ft/yr)	Current Trend — Average (ft/yr)*	Current Trend — Median (ft/yr)*
Carrizo-Wilcox	49 (±5)	−0.71	−6.27	−5.74

* Trend rates based on linear regression of measured water levels for each active monitoring well, December 31, 2011 through June 22, 2026. Combined statistics exclude telemetry wells. See Appendix K Table 1 for individual well trend calculations.

Consistent with the district-wide declining trend, the estimated drawdown since December 31, 2011 indicates that a significant portion of the 69-year DFC allowance has already been realized. Current average estimated drawdown across the monitoring network is approximately 133.3 feet and the median estimated drawdown is 142.3 feet, both exceeding the 49-foot (+- 5 feet) adopted DFC. These findings indicate the District is not currently on track to achieve its adopted secondary DFCs within the planning horizon. The following table provides the estimated drawdown for the Carrizo-Wilcox Aquifer since December 31, 2011.

Aquifer	GMA-13 DFC (ft avg. drawdown, 2011–2080)	Est. Drawdown Since 12/31/2011 — Average (ft)	Est. Drawdown Since 12/31/2011 — Median (ft)
Carrizo-Wilcox	49 (±5)	133.3	142.3

Statistics include non-telemetry confined-zone active wells only; telemetry wells excluded. See Appendix K Table 1 for individual well calculations.

It is important to note that these findings are based on a limited number of monitoring wells and the existing network may not fully capture the spatial variability of the aquifer across the District.

Groundwater conditions can vary significantly across the formation depending on local geology, proximity to pumping centers, recharge zones, and confining conditions. Wells located near active production areas may reflect localized drawdown that is not representative of broader aquifer conditions, while areas of the District with no monitoring wells remain uncharacterized. The District acknowledges that expanding spatial coverage of the monitoring network would improve the accuracy and reliability of DFC compliance assessments in future planning periods.

The District's challenge in staying on track to achieve its current DFCs is a result of two primary factors: (1) performance issues with the version of the GAM on which the current DFCs are based; and (2) spatial representation of monitoring.

(1) **GAM.** The current DFCs are based upon the version of the GAM for the Southern Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers that was developed in 2004 (the "**2004 GAM**"), which according to GMA-13's technical consultant, was not created with the development of DFCs in mind. As the technical consultant for GMA-13 has explained, the 2004 GAM had significant limitations and performance issues. In addition, GMA-13's technical consultant identified the errors between the simulated and measured water-level trends during GMA 13's discussion of the feasibility of achieving the DFCs (see also the GMA 13 Explanatory Report for 2021 joint planning).

(2) **Spatial Representation.** The monitoring wells are relatively sparse and are not representative of the aquifers considered for the DFCs. The DFCs include model results for the Sparta, Queen City, and four layers of the Carrizo-Wilcox aquifers. The District recognizes the insufficiency of the current monitoring network for a robust evaluation of aquifer status relative to the adopted DFCs.

The GAM was recently updated and may address the discrepancies between the measured and simulated water level trends. While the District is not on track to achieve the current DFCs, the values are currently being reconsidered as part of joint planning and achievement will be re-evaluated following adoption. The District is committed to continued monitoring, annual reporting, and adaptive management in coordination with GMA-13 to work toward achieving the adopted DFCs within the planning period. As District resources allow, monitoring will be expanded to more reasonably reflect how the DFCs were considered.

Outcrop Zone — Primary DFC Compliance (Saturated Thickness)

For the four (4) monitoring wells located within the Carrizo-Wilcox outcrop zone (Barrier, SW Carrizo, Shape, and Rutledge) compliance with the primary GMA-13 DFC is evaluated on the basis of saturated thickness rather than drawdown. Current and projected saturated thickness values are derived by subtracting the aquifer base elevation from the groundwater elevation values for each well. The saturated thickness is compared to the end of 2012 saturated thickness value to determine if the 75 percent threshold is adhered to or not.

As shown in Table 2 of Appendix K, all four outcrop wells (Barrier, SW Carrizo, Shape and Rutledge) are currently retaining greater than 75 percent of their December 31, 2012 saturated thickness. Based on these results, the District is on track to comply with the primary DFCs.

As with the confined-zone analysis, it should be noted that four monitoring wells are limited in their ability to characterize aquifer conditions across the full spatial extent of the outcrop zone, and results should be interpreted accordingly.

VI. Management of Groundwater Resources / Actions, Procedures, Performance and Avoidance Necessary to Effectuate the Plan

The Texas Legislature has established that GCDs are the state's preferred method of groundwater management. The Texas Legislature codified this policy decision in Section 36.0015 of the Texas Water Code, which establishes that GCDs will manage groundwater resources through rules developed and implemented in accordance with Chapter 36. Chapter 36 gives districts the tools to manage groundwater in order to protect property rights, balance the conservation and development of groundwater, and use the best available science in the conservation and development of the groundwater resources within their boundaries. The District will use the statutory provisions provided in Chapter 36 by the Texas Legislature to manage the groundwater resources within its boundaries.

The District will manage the groundwater supply within the District's boundaries to conserve the resource as much as is practicable while seeking to maintain the economic viability of all resource user groups, public and private. In consideration of the economic and cultural activities occurring within the District, the District will identify and engage in such activities and practices that will permit groundwater production and, as appropriate, protect the aquifer and groundwater in accordance with this Management Plan and the District's rules.

As described above, the Monitoring Well Network has been established to be maintained by the District in order to monitor changing water levels within the District. The District will make a regular assessment of groundwater conditions and will report those conditions to the Board and to the public. The District will, if necessary, undertake and cooperate with investigations of groundwater resources within the District and will make the results of the investigation available to the public upon adoption by the Board.

The District Rules include provisions for regulating groundwater withdrawals by means of spacing and production limits. The District Rules are available online at **https://wgcd.net/wp-content/uploads/2026/05/Rules-5-13-2026.pdf** . The District may deny a Well permit or limit groundwater withdrawals in accordance with the guidelines stated in the District Rules. In addition, as described in Section V.J above, the District will monitor groundwater levels and selected observation wells and evaluate whether the annual average change in groundwater levels is in conformance with the DFCs adopted by GMA-13 for each aquifer.

The District will estimate the total annual groundwater production for each aquifer based on water use reports, estimated exempt use, and other relevant information, and compare those production estimates to the MAGs. In order to achieve the DFCs, the District will base permitting decisions on the adopted Rules and statutory requirements in consideration of the importance of groundwater

to the economy and culture of the District. Production will be regulated, as needed, to conserve groundwater, and protect groundwater users, in a manner not to unnecessarily and adversely limit production or impact the economic viability of the public, landowners, and private groundwater users.

The District may deny or limit groundwater withdrawals in accordance with the District Rules and this Management Plan. In determining whether to issue a permit the District will consider the beneficial use and private property rights against the reasonableness of the effects of production on existing groundwater and surface water resources, existing permit holders, and wells that are registered with the District but exempt from permitting (Tex. Water Code 36.113(d)(2)) after considering all relevant evidence, appropriate testimony, and all other relevant factors.

Water conservation has become an important and effective initiative throughout the state of Texas. The District may require a conservation plan as a condition to permitting Wells to ensure that the groundwater produced is put to a beneficial use and is not wasted. The District will work with water utilities, industry (including the oil and gas sector), and agricultural users to promote the most efficient use of groundwater so that the District may effectively manage and conserve groundwater resources within the District. The District will explore other conservation methods and options and will adopt new requirements as they become appropriate.

The District will seek to cooperate with other entities regarding the implementation of this Management Plan and the management of groundwater supplies within the District. All activities of the District will be undertaken in cooperation and coordinated with the appropriate state, regional, or local water management entities.

Sustained, severe drought is a serious challenge for the District. Prolonged periods of time with little to no rainfall mean that water users in the District, particularly agricultural users, must rely more heavily on groundwater resources. The General Manager of the District will update the Board at every monthly meeting on drought conditions in the District. The General Manager will report the Palmer Drought Severity Index to the Board during the Manager's report for the month. The Board will instruct the General Manager of the appropriate actions to be taken upon notification of moderate to severe drought. The possible actions to be taken may include public service announcements on the radio, newspaper articles on conditions of the aquifer, water conservation information, and/or notices to municipal suppliers to implement their drought plans.

A well-informed public is vital to the proper operation of a GCD. The District will keep the citizens of the District informed by means of a website, timely newspaper articles and/or public service radio announcements. As part of the public information program, the General Manager may make presentations to public gatherings, as requested, in order to keep the citizens informed about District activities and promote proper use of available groundwater.

Abandoned oil wells and injection wells for oil and gas waste may pose a water quality threat to the aquifers of the District. District personnel will support public awareness that they may report abandoned oil wells and other problems associated with oil production to the District. In addition,

the District may review applications filed with the Railroad Commission of Texas ("RRC") for injection wells for oil and gas waste proposed to be located within the District. For injection wells that it is deemed construction or operation could affect managed groundwater resources, the District will participate in RRC proceedings as necessary to protect the groundwater resources managed by the District.

VII. Methodology the District Will Use to Track Progress on an Annual Basis in Achieving All Management Goals

The District General Manager will prepare an annual report on the District's performance in achieving the management goals. The annual report will be presented to the Board during the first quarter of each calendar year. The report will discuss each applicable management objective and the associated performance standards so that the effectiveness and efficiency of the activities applied towards the management objectives may be evaluated. The annual report will be maintained on file at the District office and made available to the public upon adoption by the Board.

VIII. Goals and Objectives

Goal 1.0 Providing the Most Efficient Use of Groundwater

Management Objective: The District will continue monitoring and reporting data from its water-level recorders. The District will identify and expand its monitoring well network as resources allow.

Performance Standard: The District will assimilate data from the well water level recorders and present the information to the Board monthly.

Goal 2.0 Controlling and Preventing Waste of Groundwater

Management Objective: The District will, on at least two (2) occasions each year, provide public information on water conservation and waste prevention through public speaking appearances at public schools or civic organizations or through newspaper articles.

Performance Standard:

A. The number of speaking appearances made by the District each year.

B. The number of newspaper articles published by the District each year.

Management Objective: The District will identify Well owners that are not in compliance with District well permitting, registration, reporting, or fee payment requirements and bring them into compliance.

Performance Standard: The District will compare existing state records and field staff observations with the well registration database to identify noncompliant well owners and make a report to the Board listing identified violations.

Management Objective: The District will investigate instances of potential waste of groundwater within 72 hours of receiving complaints.

Performance Standard: District staff will report to the Board as needed regarding potential waste of groundwater and include the number of investigations in its annual report.

Management Objective: The District will investigate reports of abandoned wells within 72 hours of receiving complaints.

Performance Standard: District staff will report to the Board as needed regarding potential abandoned wells. The Board will direct District staff regarding steps to ensure the well is plugged if applicable. Plugging may be facilitated through District funding or the well owner as directed by the Board.

Goal 3.0 Controlling and Preventing Subsidence

Based on a review of the "Identification of the Vulnerability of the Major and Minor aquifers of Texas to Subsidence with regard to Groundwater Pumping – TWDB Contract Number 1648302062, by LRW Water," including Section 4.2.1 of that report, the Board has determined this management goal is not applicable to the District because subsidence is not a problem identified in the District or region. As noted in figures 4.7, 4.122, 4.136 and 4.151 of the LRE Water report, the risk vulnerability for the aquifers in the District is generally characterized as "low". The Board commits to monitoring for any indications of subsidence by recording and investigating all reports of potential subsidence brought to the attention of the Board.

Goal 4.0 Addressing Conjunctive Surface Water Management Issues

Management Objective: The District will confer with the Nueces River Authority at least once each year to discuss cooperative opportunities for conjunctive resource management.

Performance Standard: The number of conferences on conjunctive resource management opportunities held with Nueces River Authority each year.

Management Objective: The designated Board member or General Manager will attend, at a minimum, 75 percent of the meetings and events of the Region L Water Planning Group.

Performance Standard: The designated Board member or General Manager will report on actions of the Region L Water Planning Group as appropriate to the Board, and the General Manager will document meetings attended in the Annual Report.

Goal 5.0 Addressing Natural Resource Issues that Impact the Use and Availability of Groundwater

Management Objective: Each year, the District will ensure that all new wells permitted for construction within the District and exempt wells that are registered comply with the District construction standards through monitoring of the state of Texas water well report required to be provided to the District by water well drillers.

Performance Standard: The number of newly permitted water wells within the District monitored for compliance will be reported to the Board annually.

Management Objective: The District may review applications filed with the RRC for oil and gas waste disposal or recycling. The District may participate in RRC proceedings regarding those applications as necessary to protect the groundwater resources managed by the District.

Performance Standard: Annual Report and monthly updates to the Board summarizing the District's activities related to RRC oil and gas waste disposal or recycling applications.

Goal 6.0 Addressing Water Conservation

Management Objective: The District will promote water conservation by promoting water stewardship by raising public awareness of the necessity and importance of water conservation. The District will, on at least two (2) occasions each year, provide public information on water conservation and waste prevention through public speaking appearances at public schools or civic organizations or through newspaper articles.

Performance Standard: Annual Report to the Board indicating the number of individuals or schools addressed.

Performance Standard: The number of newspaper articles published encouraging water conservation.

Goal 7.0 Addressing Recharge Enhancement

The Board determined that recharge enhancement is not cost effective and is not appropriate for the District at this time.

Goal 8.0 Addressing Precipitation Enhancement

The Board determined that precipitation enhancement is not cost effective and is not appropriate for the District at this time.

Goal 9.0 Addressing Brush Control

The Board determined that brush control enhancement is not cost effective and is not appropriate for the District at this time.

Goal 10.0 Rainwater Harvesting

Management Objective: The District, in conjunction with other entities, will sponsor, in part, with the entity a rainwater harvesting system for their use, public observation, and education.

Performance Standard: The District will determine the volume of rainwater captured per year and include this information in the annual report to the Board of Directors.

Goal 11.0 Addressing Drought Conditions

Management Objective: Each month the District will download the Palmer Drought Severity Index map by accessing the National Weather Service - Climate Prediction Center website http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml. The District will check for updates on the TWDB web page http://waterdatafortexas.org/drought/.

Performance Standard: The District will assess the status of drought in the District and prepare a briefing with maps and situation reports for the Board. Monthly downloads will be filed for future use.

Goal 12.0 Addressing the Desired Future Conditions

Management Objective: The District will annually compile well monitoring data from wells within the District then calculate average and median well trend rates to compare to the DFCs annual drawdown rate and saturated thickness thresholds. The District will identify and expand its monitoring well network as resources allow.

Performance Standard: The District's Annual Report will include a discussion of the newly permitted wells along with water level data as it relates to the desired future conditions.

References

1. Bulletin 6003 Geology and Ground-Water Resources of Dimmit County; Texas Board of Water Engineers; June 1960
2. Bulletin 6520 Ground-Water Resources of La Salle and Mc Mullen Counties, Texas; Texas Water Commission, August 1965
3. Geology and Ground-Water Resources of the Winter Garden District Texas 1948; Geologic Survey Water-Supply Paper 1481; U.S. Department of the Interior
4. GAM Run 21-018 MAG: Modeled Available Groundwater for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson Aquifers in Groundwater Management Area 13" dated July 2, 2022
5. GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan" dated September 30, 2020 Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden Groundwater Conservation District" dated May 2, 2026

Appendix A

House Bill 3602

By King H.B. No. 3602

75R12027 JMC-D

A BILL TO BE ENTITLED

AN ACT

relating to the creation, administration, powers, duties, operation, and financing of the Wintergarden Groundwater Conservation District.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. CREATION. (a) A groundwater conservation district, to be known as the Wintergarden Groundwater Conservation District, is created in Zavala, Dimmit, and La Salle counties, subject to approval at a confirmation election under Section 8 of this Act. The district is a governmental agency and a body politic and corporate.

(b) The district is created under and is essential to accomplish the purposes of Section 59, Article XVI, Texas Constitution.

SECTION 2. DEFINITION. In this Act, "district" means the Wintergarden Groundwater Conservation District.

SECTION 3. BOUNDARIES. The boundaries of the district are coextensive with the boundaries of Zavala, Dimmit, and La Salle counties.

SECTION 4. FINDING OF BENEFIT. All of the land and other property included within the boundaries of the district will be benefited by the works and projects that are to be accomplished by the district under powers conferred by Section 59, Article XVI, Texas Constitution. The district is created to serve a public use and benefit.

SECTION 5. POWERS. (a) The district has all of the rights, powers, privileges, authority, functions, and duties provided by the general law of this state, including Chapters 36 and 49, Water Code, applicable to groundwater conservation districts created

under Section 59, Article XVI, Texas Constitution. This Act prevails over any provision of general law that is in conflict or inconsistent with this Act.

(b) The rights, powers, privileges, authority, functions, and duties of the district are subject to the continuing right of supervision of the state to be exercised by and through the Texas Natural Resource Conservation Commission.

SECTION 6. BOARD OF DIRECTORS. (a) The district is governed by a board of seven directors.

(b) Temporary directors serve until initial permanent directors are elected under Section 8 of this Act.

(c) Initial permanent directors serve until permanent directors are elected under Section 9 of this Act.

(d) Permanent directors other than initial permanent directors serve staggered four-year terms.

(e) Each director must qualify to serve as director in the manner provided by Section 36.055, Water Code.

(f) A director serves until the director's successor has qualified.

SECTION 7. TEMPORARY DIRECTORS. (a) The temporary board of directors is composed of:

(1) Jay Myers, director at large;

(2) Cleo Bustamante;

(3) John Petry;

(4) Alfredo Zamora;

(5) Robert Hart;

(6) Ana Maria Farias; and

(7) James Camilo Flanagan.

(b) If a temporary director fails to qualify for office, the temporary directors who have qualified shall appoint a person to fill the vacancy. If at any time there are fewer than four qualified temporary directors, the Texas Natural Resource Conservation Commission shall appoint the necessary number of

persons to fill all vacancies on the board.

SECTION 8. CONFIRMATION AND INITIAL DIRECTORS' ELECTION. (a) The temporary board of directors shall call and hold an election to confirm establishment of the district and to elect two initial directors from each county in the district and one initial director at large from the district.

(b) At the confirmation and initial directors' election, the temporary board of directors shall provide for a ballot that permits voting for or against confirmation of the district and that permits qualified voters in each county to vote for two initial directors to represent the county and one initial director at large. The temporary board shall have the names of the persons serving as temporary directors placed on the ballot together with the name of any candidate filing for the office of director and blank spaces to write in the names of other persons. If the district is confirmed at the election, the temporary directors, at the time the vote is canvassed, shall declare the person who received the most votes for director at large and the two persons in each county who received the most votes in the county for a position other than director at large to be elected as the initial directors. The temporary directors shall include the results of the directors' election in the district's election report to the Texas Natural Resource Conservation Commission.

(c) An initial director elected from a county must reside in the county represented by the initial director. An initial director elected at large from the district must reside in the district.

(d) Section 41.001(a), Election Code, does not apply to a confirmation and initial directors' election held as provided by this section.

(e) Except as provided by this section, a confirmation and initial directors' election must be conducted as provided by

Sections 36.017(b)-(h), Water Code, and the Election Code.

SECTION 9. ELECTION OF DIRECTORS. (a) On the first Saturday in May of the second year after the year in which the district is authorized to be created at a confirmation election, an election shall be held in the district for the election of two directors from each county in the district and one director at large from the district. Three directors elected under this subsection shall each serve a two-year term, and four directors elected under this subsection shall each serve a four-year term.

(b) A director elected from a county must reside in the county represented by the director. A director elected at large from the district must reside in the district.

(c) On the first Saturday in May of each subsequent second year following the election, the appropriate number of directors shall be elected to the board.

SECTION 10. FINDINGS RELATED TO PROCEDURAL REQUIREMENTS. (a) The proper and legal notice of the intention to introduce this Act, setting forth the general substance of this Act, has been published as provided by law, and the notice and a copy of this Act have been furnished to all persons, agencies, officials, or entities to which they are required to be furnished by the constitution and other laws of this state, including the governor, who has submitted the notice and Act to the Texas Natural Resource Conservation Commission.

(b) The Texas Natural Resource Conservation Commission has filed its recommendations relating to this Act with the governor, lieutenant governor, and speaker of the house of representatives within the required time.

(c) All requirements of the constitution and laws of this state and the rules and procedures of the legislature with respect to the notice, introduction, and passage of this Act are fulfilled and accomplished.

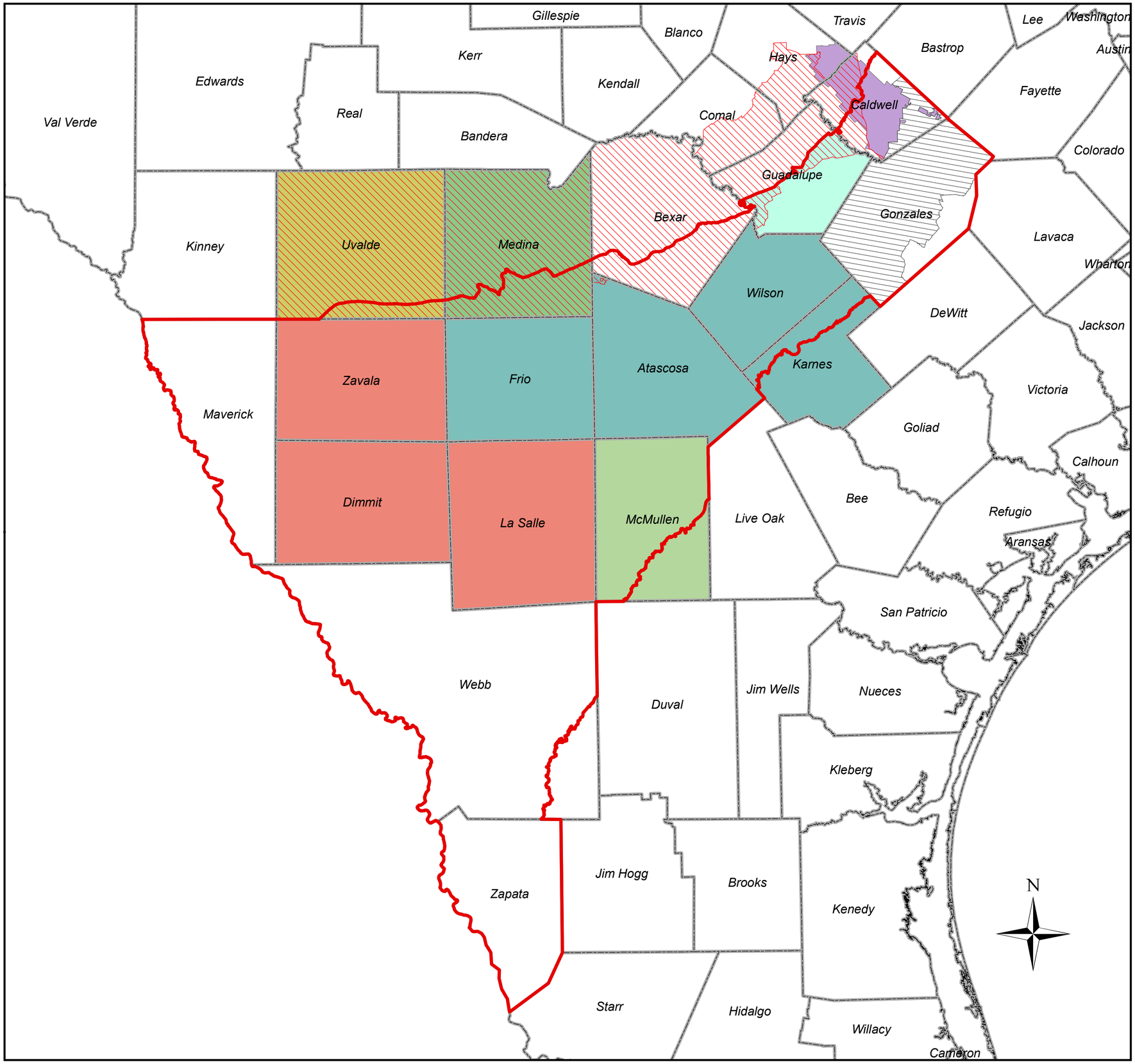
SECTION 11. EMERGENCY. The importance of this legislation

and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended, and that this Act take effect and be in force from and after its passage, and it is so enacted.

Appendix B

Map of Boundaries of Wintergarden Groundwater Conservation District

Groundwater Management Area 13



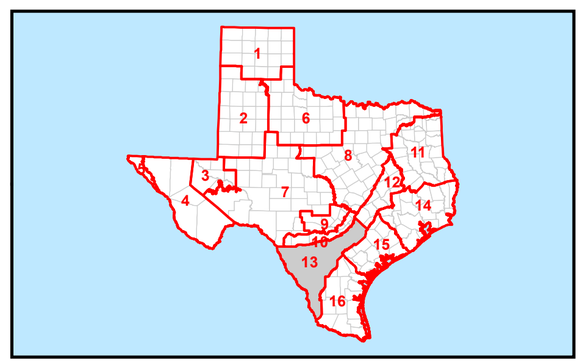
MAP LEGEND

- Groundwater Management Area 13
- Counties

Groundwater Conservation Districts

- Edwards Aquifer Authority
- Evergreen UWCD
- Gonzales County UWCD
- Guadalupe County GCD
- McMullen GCD
- Medina County GCD
- Plum Creek CD
- Uvalde County UWCD
- Wintergarden GCD

Updated 8/26/2015



0 5 10 20 30 40 Miles

1 in = 19 miles

APPENDIX C

FILED
DATE July 22, 2026
AT 8:57 O'CLOCK A M
CLAUDIA McDANIEL
County Clerk, Dimmit County, Texas
By Claudia McDaniel

NOTICE OF PUBLIC HEARING

The Wintergarden Groundwater Conservation District (WGCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 8:00 a.m., August 4, 2026, in the WGCD Headquarters, 2881 Hwy 277. Carrizo Springs, Texas. Copies of the revised Management Plan are available for review at the District Office and the WGCD website at https://wgcd.net

Contact the WGCD at 830-876-3801 or email: wgcd@wgcd.net for additional information

Dated: **July 22nd, 2026**

WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT

Dirk Aaron
Interim General Manager

NOTICE OF PUBLIC HEARING

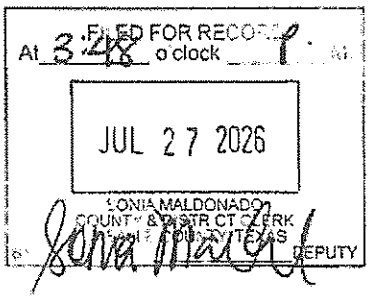
The Wintergarden Groundwater Conservation District (WGCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 8:00 a.m., August 4, 2026, in the WGCD Headquarters, 2881 Hwy 277. Carrizo Springs, Texas. Copies of the revised Management Plan are available for review at the District Office and the WGCD website at https://wgcd.net

Contact the WGCD at 830-876-3801 or email: wgcd@wgcd.net for additional information

Dated: **July 22nd, 2026**

WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT

Dirk Aaron
Interim General Manager



POSTED
This 22 day of July ,26
At 3:03 o'clock, P M
MICHELLE B. URRABAZO
County Clerk, Zavala County, Texas
By Vanessa Vasquez

NOTICE OF PUBLIC HEARING

The Wintergarden Groundwater Conservation District (WGCD) will hold a public hearing and consider adopting proposed update with revisions to the District Groundwater Management Plan at 8:00 p.m., August 4, 2026, in the WGCD Headquarters, 2881 Hwy 277. Carrizo Springs, Texas. Copies of the revised Management Plan are available for review at the District Office and the WGCD website at https://wgcd.net

Contact the WGCD at 830-876-3801 or email: wgcd@wgcd.net for additional information

Dated: **July 22nd, 2026**

WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT

Dirk Aaron
Interim General Manager

Appendix D

Certified Copy of the Board Resolution Adopting the Management Plan

RESOLUTION
OF THE BOARD OF DIRECTORS OF THE
WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT
MEETING HELD AUGUST 4, 2025

A RESOLUTION ADOPTING AMENDED MANAGEMENT PLAN

WHEREAS, Wintergarden Groundwater Conservation District is a political subdivision of the State of Texas and a groundwater conservation district created and operating under and by virtue of Article XVI, Section 59, of the Texas Constitution; Texas Water Code Chapter 36; the District's enabling act, Act of May 30, 1997, 75th Legislature, Regular Session, Chapter 1149 (House Bill 3602), known as the Wintergarden Groundwater Conservation District Act; and the applicable general laws of the State of Texas. The District was confirmed by the voters of Dimmit, La Salle, and Zavala counties in January 1998.

WHEREAS, under the direction of the Board of Directors, and in accordance with Texas Water Code§§ 36.1071 and 36.1072, Title 31, Chapter 356 of the Texas Administrative Code, and the District's rules, the District has timely undertaken the requisite five-year review of its existing Groundwater Management Plan, adopted on October 10, 2021, and certified by the TWDB on October 19, 2021, and now has taken the revised plan to the board for adoption on this day August 4, 2026

WHEREAS, in conducting a the requisite five-year review of its existing Groundwater Management Plan, the District and its consultants reviewed, analyzed, and factored in the District's best available data, the groundwater availability modeling information provided by the TWDB, the technical information and estimates required by the TWDB, for Fourth Round of Desired Future Conditions GMA13 of the aquifers within the District, and the available site-specific information that has previously been provided by the District to the TWDB for review and comment;

WHEREAS, the District issued the appropriate notices and held a public hearing to receive public comments on the proposed amendments to the Groundwater Management Plan at the District's office located at 2881 Hwy 2881, Carrizo Springs, Texas, on August 4, 2026;

WHEREAS, the District obtained comments from the TWDB through a preliminary review process the District's Groundwater Management Plan conducted by TWDB staff, and the District has considered and addressed all such comments in the development of its Management Plan;

WHEREAS, the District requested, received, reviewed, and took into consideration comments from the Nueces River Authority the Surface Water Management Entity during preparation of its Groundwater Management Plan;

WHEREAS, the Board of Directors finds that the Groundwater Management Plan meets all of the requirements of Chapter 36 of the Texas Water Code, the District's enabling act, Chapter 356, Title 31, Texas Administrative Code, and the District's rules; and

WHEREAS, the Board of Directors, upon proper notice and in an open meeting, seeks to re-adopt its amended Groundwater Management Plan pursuant to Texas Water Code§ 36.1072(e).

NOW THEREFORE BE IT RESOLVED THAT:

The above recitals are true and correct;

The Groundwater Management Plan is hereby readopted with those changes reflected in the proposed, draft Groundwater Management Plan before the District's Board of Directors on this date, along with those changes agreed upon during deliberation and after formal action on this date by the District's Board of Directors;

The Board of Directors further instructs the Interim General Manager to compile a final, readopted Groundwater Management Plan, and file it with the TWDB's Executive Director within 60 calendar days from the date of re-adoption, pursuant to Texas Water Code § 36.1072(e); and

The Board of Directors and General Manager are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of §36.1072 of the Texas Water Code.

AND IT IS SO ORDERED.

Upon motion duly made by Neal Llewellyn, and seconded by Corky Weeks upon discussion, the Board of Directors voted 6 in favor and 0 opposed, 0 abstained, and 1 absent, and the motion thereby PASSED on this 4th day of August 2026.

WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT

SIGNED:

Board President: Von R. Box DATE: 8/4/26
Von Box

Board ~~Vice President~~ Secretary: Ed Ritchie DATE: 8-04-2026
~~Travis Evins~~
Ed Ritchie

Appendix E

Correspondence to Surface Water Management Entities

Wintergarden Groundwater Conservation District

P.0. Box 1433
Carrizo Springs, TX 78834 830-876-3801
830-876-3782 FAX
www.wgcd.net

Mr. John J. Byrum II
jbyrum@nueces-ra.org
Executive Director
Nueces River Authority
539 South Highway 83
Uvalde, Texas 78801

July 13, 2026

Dear Mr. Byrum:

On behalf of the Board of Directors of the Wintergarden Groundwater Conservation District, it is my privilege to provide you with a copy of the district's recent update to their Groundwater Management Plan for your review and consideration.

As an important regional water partner within the Nueces River Basin, the Nueces River Authority's perspective is both valued and appreciated. Should you or your staff have any comments, recommendations, or additional information that you believe would strengthen the Plan, we respectfully invite you to share those with the district.

The proposed Groundwater Management Plan is scheduled to be presented to the Board of Directors during a public hearing no later than Wednesday, **August 4, 2026**. To the extent practicable, comments received in advance of that hearing will be considered as part of the Board's review process.

Thank you for your continued commitment to the responsible stewardship of the water resources within the Nueces River Basin. We appreciate your time and consideration and look forward to your thoughts.

Sincerely,
Dirk Aaron
Interim General Manager Services
Wintergarden Groundwater Conservation District
wgcd@wgcd.net
dirk@dirkaaron.com

cc: John Chisholm, Deputy Executive Director
jchisholm@nueces-ra.org

Appendix F

Desired Future Conditions Resolution 21-02

Groundwater Management Area 13
Resolution 21-02

Desired Future Conditions for the Carrizo-Wilcox, Queen City, and Sparta Aquifers in Groundwater Management Area 13

WHEREAS, Groundwater Conservation Districts (GCDs) located within or partially within Groundwater Management Area 13 (GMA 13) are required under Chapter 36.108, Texas Water Code to conduct joint planning and designate the Desired Future Conditions of aquifers within GMA 13 and;

WHEREAS, the Groundwater Conservation Districts located wholly or partially within GMA 13, as designated by the Texas Water Development Board, as of the date of this Resolution are: Evergreen Underground Water Conservation District, Gonzales County Underground Water Conservation District, Guadalupe County Groundwater Conservation District, Medina County Groundwater Conservation District, McMullen County Groundwater Conservation District, Plum Creek Conservation District, Uvalde County Underground Water Conservation District, Wintergarden Groundwater Conservation District.

WHEREAS, the Board Presidents or their Designated Representatives of GCDs in GMA 13 have met in various meetings and conducted joint planning in accordance with §36.108, Texas Water Code since September 2010; and

WHEREAS, the GMA 13 committee has received and considered Groundwater Availability Model runs and other technical advice regarding local aquifers, hydrology, geology, recharge characteristics, the nine factors set forth in §36.108(d) of the Texas Water Code, local groundwater demands and usage, population projections, total water supply and quality of water supply available from all aquifers within the respective GCDs, regional water plan water management strategies, ground and surface water interactions, that affect groundwater conditions through the year 2080; and

WHEREAS, the member GCDs of GMA 13, having given proper and timely notice, held an open meeting on 11-19-21 2021 at the offices of the Evergreen Underground Water Conservation District located at 110 Wyoming Blvd., Pleasanton, Texas, to vote to adopt proposed Desired Future Conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers within the boundaries of GMA 13; and

WHEREAS, the member GCDs in which the Carrizo-Wilcox, Queen City, and Sparta aquifers are relevant for joint planning purposes held open meetings within each said district between April 30, 2021 and July 30, 2021 to take public comment on the proposed DFCs for that district; and

WHEREAS on this day of 11-19-21, at an open meeting duly noticed and held in accordance with law at the offices of the Evergreen Underground Water Conservation District located at 110 Wyoming Blvd., Pleasanton, Texas, the GCDs within GMA 13, having considered at this meeting comments submitted to the individual districts during the comment period and at this meeting, have voted, 7 districts favored, 0 districts

opposed, 0 districts abstained to adopt the following DFCs for in the following counties and districts through the year 2080 as follows:

Due to limitations of the Groundwater Availability model for the Southern Portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers identified and discussed during 2016 (Hutchison, 2017a) and 2021 Joint Planning, Groundwater Management Area 13 proposes two desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers as described below.

- The first desired future condition for the Carrizo-Wilcox, Queen City and Sparta aquifers in Groundwater Management Area 13 is that 75 percent of the saturated thickness in the outcrop at the end of 2012 remains at the end 2080. Due to limitations of the current Groundwater Availability Model, this desired future condition cannot be simulated as documented during 2016 Joint Planning in GMA 13 Technical Memorandum 16-08 (Hutchison, 2017d).

- In addition, a secondary desired future condition for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 is an average drawdown of 49 feet (+/- 5 feet) for all of GMA 13. The drawdown is calculated from the end of 2012 conditions to the year 2080. This desired future condition is consistent with simulation "GMA13_2019_001" summarized during a meeting of Groundwater Management Area 13 members on March 19, 2021.

NOW THEREFORE BE IT RESOLVED, that Groundwater Management Area 13 does hereby document, record, and confirm the above-described Desired Future Conditions for the Carrizo-Wilcox, Queen City, and Sparta Aquifers which were adopted by vote of the following Designated Representatives of Groundwater Conservation Districts present and voting on Nov. 19, 2021.

FAVORED

Diane Savage, Evergreen Underground Water Conservation District

Laura Martin, Gonzales County Underground Water Conservation District

Kelley Vickers, Guadalupe County Groundwater Conservation District

Not Present

David Caldwell, Medina County Groundwater Conservation District

Lonnie Stewart, McMullen County Groundwater Conservation District

Daniel Meyer, Plum Creek Conservation District

Vic Hildebran, Uvalde County Underground Water Conservation District

Debbie Farmer, Wintergarden Groundwater Conservation District

OPPOSED

None

ABSTAINED

None

Appendix G

GAM Run 21-018 MAG: Modeled Available Groundwater for the

Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson Aquifers in Groundwater

Management Area 13 dated July 25, 2022

GAM RUN 21-018 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS IN GROUNDWATER MANAGEMENT AREA 13

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
July 25, 2022

Shirley C. Wade
7/25/22

This page is intentionally left blank.

GAM RUN 21-018 MAG: MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS IN GROUNDWATER MANAGEMENT AREA 13

Shirley C. Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 936-0883
July 25, 2022

EXECUTIVE SUMMARY:

The modeled available groundwater for Groundwater Management Area 13 for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers is summarized by decade for the groundwater conservation districts (Tables 1 through 4 respectively) and for use in the regional water planning process (Tables 5 through 8 respectively). The modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 470,000 acre-feet per year in 2020 to approximately 575,000 acre-feet per year in 2080 (Table 1). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 23,000 acre-feet per year in 2020 to approximately 18,000 acre-feet per year in 2080 (Table 2). The modeled available groundwater estimates for the Sparta Aquifer range from approximately 6,000 acre-feet per year in 2020 to approximately 4,000 acre-feet per year in 2080 (Table 3). The estimates for the Carrizo-Wilcox, Queen City, and Sparta Aquifers were extracted from the results of a model run using the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (version 2.01). The modeled available groundwater estimates for the Yegua-Jackson Aquifer are approximately 6,700 acre-feet per year from 2020 to 2080 (Table 4). The estimates for the Yegua-Jackson Aquifer were extracted from the results of a model run using the groundwater availability model for the Yegua-Jackson Aquifer (version 1.01). The explanatory report and other materials submitted to the TWDB were determined to be administratively complete on April 15, 2022.

REQUESTOR:

Ms. Kelley Cochran, coordinator of Groundwater Management Area 13.

DESCRIPTION OF REQUEST:

The desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta aquifers described in Resolution 21-02 from Groundwater Management Area 13, adopted November 19, 2021, are:

- *"The first desired future condition for the Carrizo-Wilcox, Queen City and Sparta aquifers in Groundwater Management Area 13 is that 75 percent of the saturated thickness in the outcrop at the end of 2012 remains in 2080. Due to the limitations of the current Groundwater Availability Model, this desired future condition cannot be simulated as documented during 2016 Joint Planning in GMA 13 Technical Memorandum 16-08 (Hutchison, 2017a)."*
- *"In addition, a secondary proposed desired future condition for the Carrizo-Wilcox, Queen City, and Sparta aquifers in Groundwater Management Area 13 is an average drawdown of 49 feet (+/- 5 feet) for all of GMA 13. The drawdown is calculated from the end of 2012 conditions to the year 2080. This desired future condition is consistent with simulation "GMA13_2019_001" summarized during a meeting of Groundwater Management Area 13 members on March 19, 2021."*

The desired future conditions for the Yegua-Jackson Aquifer described in Resolution 21-03 from Groundwater Management Area 13, adopted November 19, 2021 are:

- *"For Gonzales County, the average drawdown from 2010 to 2080 is 3 feet (+/- 1 foot)."*
- *"For Karnes County, the average drawdown from 2010 to 2080 is 1 foot (+/- 1 foot)."*
- *"For all other counties in GMA 13, the Yegua-Jackson is classified as not relevant for purposes of joint planning."*

The Edwards (Balcones Fault Zone), Gulf Coast, and Trinity aquifers were declared not relevant for purposes of joint planning by Groundwater Management Area 13 in Resolution 21-01 (Groundwater Management Area 13 Joint Planning Committee and others, 2022; Appendix B).

On January 14, 2022, Dr. Jordan Furnans, on behalf of Groundwater Management Area 13, submitted the Desired Future Conditions Packet to the TWDB. TWDB staff reviewed the model files associated with the desired future conditions and received clarifications on procedures and assumptions from the Groundwater Management Area 13 Technical Coordinator on March 3, 2022, and on March 7, 2022. Groundwater Management Area 13 adopted two desired future conditions for the Carrizo-Wilcox, Queen City, and Sparta Aquifers and they were not mutually compatible in the groundwater availability model. The

technical coordinator for the groundwater management area confirmed that their intention was for the modeled available groundwater values to be based on the secondary desired future condition and MODFLOW pumping simulation GMA13_2019_001 (Groundwater Management Area 13 Joint Planning Committee and others, 2022; Appendix 2). The first proposed desired future condition was not intended for the calculation of modeled available groundwater.

The model run pumping file, which meets the secondary desired future condition adopted by district representatives of Groundwater Management Area 13 for the Carrizo-Wilcox, Queen City, and Sparta Aquifers, was submitted to the TWDB as supplemental information for the original submittal on February 9, 2022. The model run files, which meet the desired future conditions adopted by district representatives of Groundwater Management Area 13 for the Yegua-Jackson Aquifer, were submitted to the TWDB on January 14, 2022, as part of the Desired Future Conditions Explanatory Report for Groundwater Management Area 13.

In an email dated March 3, 2022, the Technical Coordinator and consultant for Groundwater Management Area 13 confirmed that they intended to use the end of 2011 as the reference year for the drawdown calculations for the Carrizo-Wilcox, Queen City, and Sparta aquifers and they intended to use the end of 2009 as the reference year for the Yegua-Jackson Aquifer. In an email dated March 7, 2022, they also confirmed that the confining unit model layers representing the Reklaw and Weches formations should be included in the desired future condition calculation of average drawdown for the combined Carrizo-Wilcox, Queen City, and Sparta aquifers.

All clarifications are included in the Parameters and Assumptions Section of this report.

METHODS:

The groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Figures 1 through 3) was run using the model files submitted with the explanatory reports (Groundwater Management Area 13 Joint Planning Committee and others, 2022) on January 14 and February 9, 2022. Model-calculated water levels were extracted for the years 2011 (stress period 12) and 2080 (stress period 81). An overall drawdown average was calculated for the entire Groundwater Management Area 13 using all model layers in the average. As described in the Technical Memorandum submitted with the Explanatory Report on January 14, 2022 (Furnans, 2022) drawdowns for cells that became dry during the simulation (water level dropped below the base of the cell) were calculated as the reference year water level elevation minus the elevation of the model cell bottom. The calculated drawdown average was compared with the desired future condition of 49 feet to verify that the pumping scenario achieved the desired future conditions within the stated tolerance of five feet.

The groundwater availability model for the Yegua-Jackson Aquifer (Figure 4) was run using the model files submitted on January 14, 2022. Model-calculated water levels were extracted for the years 2009 (stress period 39) and 2080 (stress period 110). County-wide average drawdowns were calculated for Gonzales and Karnes counties within Groundwater Management Area 13 by averaging the drawdown values for all model layers. There were no dry cells in Karnes County or Gonzales County, so no additional dry cell calculations were needed. The calculated drawdown averages were compared with the desired future conditions for Gonzales and Karnes counties to verify that the pumping scenario achieved the desired future conditions within the stated tolerance of one foot.

The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates by aquifer are presented by county and groundwater conservation district, subtotaled by groundwater conservation district, and then summed for Groundwater Management Area 13 (Tables 1 through 4). Annual pumping rates by aquifer are also presented by county, river basin, and regional water planning area within Groundwater Management Area 13 (Tables 5 through 8) in order to be consistent with the format used in the regional water planning process.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code (2011), "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the modeled available groundwater estimates are described below:

Carrizo-Wilcox, Queen City, and Sparta aquifers

- We used Version 2.01 of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the southern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- This groundwater availability model includes eight layers, which generally represent the Sparta Aquifer (Layer 1), the Weches Confining Unit (Layer 2), the Queen City Aquifer (Layer 3), the Reklaw Confining Unit (Layer 4), the Carrizo (Layer 5), the Upper Wilcox (Layer 6), the Middle Wilcox (Layer 7), and the Lower Wilcox (Layer 8). Since the model extends beyond the official TWDB aquifer extents, please note that model layers 1 and 3 instead represent geologic units equivalent to the Sparta and Queen City aquifers, respectively, in those areas falling outside of the official aquifer extents.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).
- Although the original groundwater availability model was only calibrated to 1999, an analysis during the second round of joint planning (Hutchison, 2017b) verified that the model satisfactorily matched measured water levels for the period from 1999 to 2011. For this reason, TWDB considers it acceptable to use the end of 2011 as the reference year for drawdown calculations.
- Drawdown averages and modeled available groundwater values were based on the TWDB defined aquifer boundaries rather than the model extent.
- Drawdowns for cells that became dry during the simulation (water level dropped below the base of the cell) were calculated as the reference year water level elevation minus the elevation of the model cell bottom. Pumping in dry cells was excluded from the modeled available groundwater calculations for the decades after the cell went dry.
- A tolerance of five feet was assumed when comparing desired future conditions to modeled drawdown results. This tolerance was specified by the GMA in their definition of the desired future conditions.
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.
- The verification calculation for the desired future conditions is based on an average of all model layers (Layers 1 through 8). The modeled available groundwater

calculations are based on Layer 1 for the Sparta Aquifer, Layer 3 for the Queen City Aquifer, and the sum of Layers 5 through 8 for the Carrizo-Wilcox Aquifer.

Yegua-Jackson Aquifer

- We used version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.
- This groundwater availability model includes five layers which represent the outcrop of the Yegua-Jackson Aquifer and younger overlying units—the Catahoula Formation (Layer 1), the upper portion of the Jackson Group (Layer 2), the lower portion of the Jackson Group (Layer 3), the upper portion of the Yegua Group (Layer 4), and the lower portion of the Yegua Group (Layer 5).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- Although the original groundwater availability model was only calibrated to 1997, a TWDB analysis (Oliver, 2010) verified that the model satisfactorily matched measured water levels for the period from 1997 to 2009. For this reason, TWDB considers it acceptable to use the end of 2009 as the reference year for drawdown calculations.
- Drawdown averages and modeled available groundwater values were based on the TWDB-defined aquifer boundaries rather than the model extent.
- No dry cells occurred in the simulation in Gonzales County or Karnes County. As these were the only counties with defined desired future conditions, no dry cell considerations were required during the verification calculation for the desired future conditions. Pumping in dry cells was excluded from the modeled available groundwater calculations for the decades after the cell went dry.
- A tolerance of one foot was assumed when comparing desired future conditions to modeled drawdown results. This tolerance was specified by the GMA in their definition of the desired future conditions.
- Estimates of modeled available groundwater from the model simulation were rounded to the nearest whole number.
- The verification calculation for the desired future conditions is based on an average of all model layers representing the Yegua or Jackson formations (Layers 1 through 5). The modeled available groundwater calculations are the sum of all model layers representing the Yegua or Jackson formations (Layers 1 through 5).

RESULTS:

The modeled available groundwater estimates for the Carrizo-Wilcox Aquifer range from approximately 470,000 acre-feet per year in 2020 to approximately 575,000 acre-feet per year in 2080 (Table 1). The modeled available groundwater estimates for the Queen City Aquifer range from approximately 23,000 acre-feet per year in 2020 to approximately 18,000 acre-feet per year in 2080 (Table 2). The modeled available groundwater estimate for the Sparta Aquifer ranges from approximately 6,000 acre-feet per year in 2020 to approximately 4,000 acre-feet per year in 2080 (Table 3). The modeled available groundwater is summarized by groundwater conservation district and county for the Carrizo-Wilcox, Queen City, and Sparta aquifers (Tables 1, 2, and 3 respectively). The modeled available groundwater has also been summarized by county, river basin, and regional water planning area for use in the regional water planning process for the Carrizo-Wilcox, Queen City, and Sparta aquifers (Tables 5, 6, and 7 respectively). Small differences in values between table summaries are due to rounding.

The modeled available groundwater estimate for the Yegua-Jackson Aquifer is approximately 7,000 acre-feet per year from 2020 to 2080 (Table 4). The modeled available groundwater for the Yegua-Jackson Aquifer is summarized by groundwater conservation district and county (Table 4) and by county, river basin, and regional water planning area for use in the regional water planning process (Table 8). Small differences of values between table summaries are due to rounding.

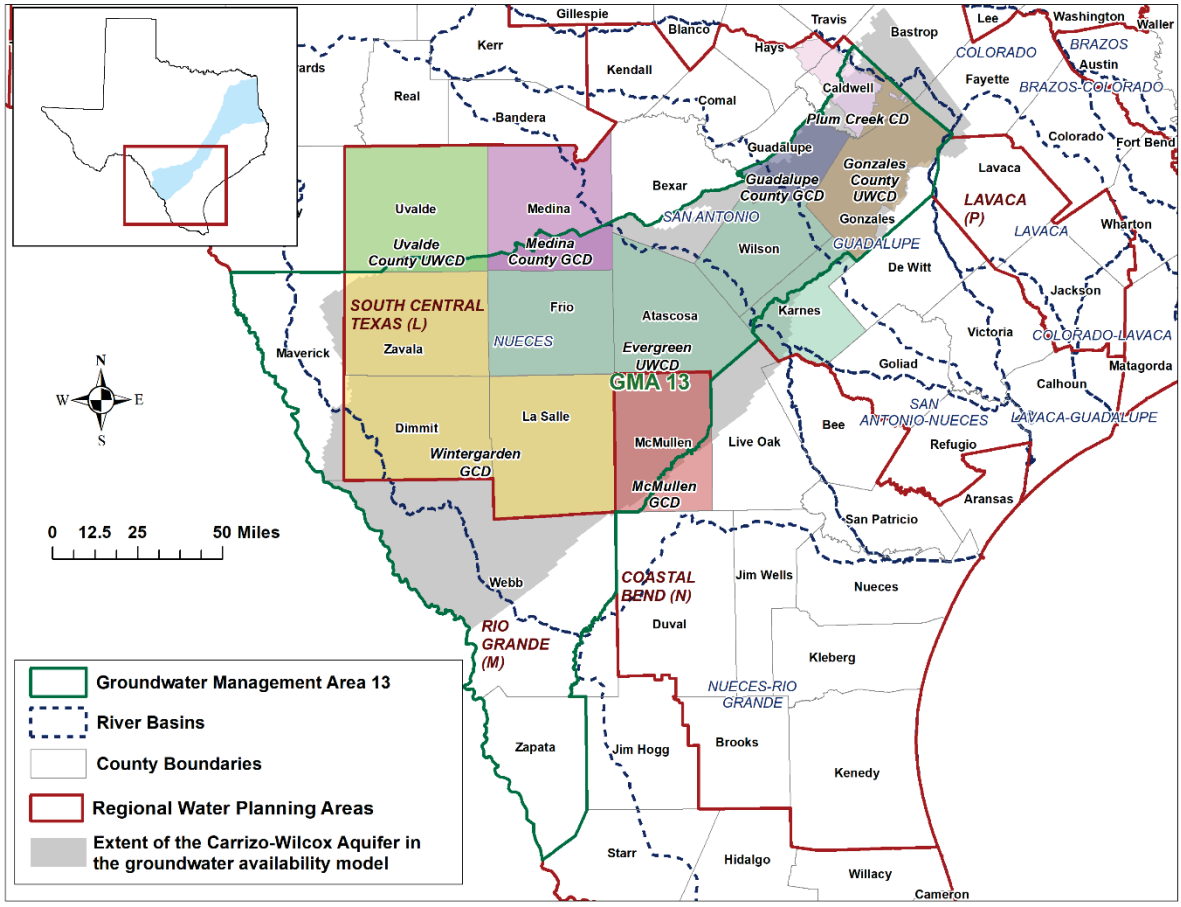


FIGURE 1. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE CARRIZO-WILCOX AQUIFER.

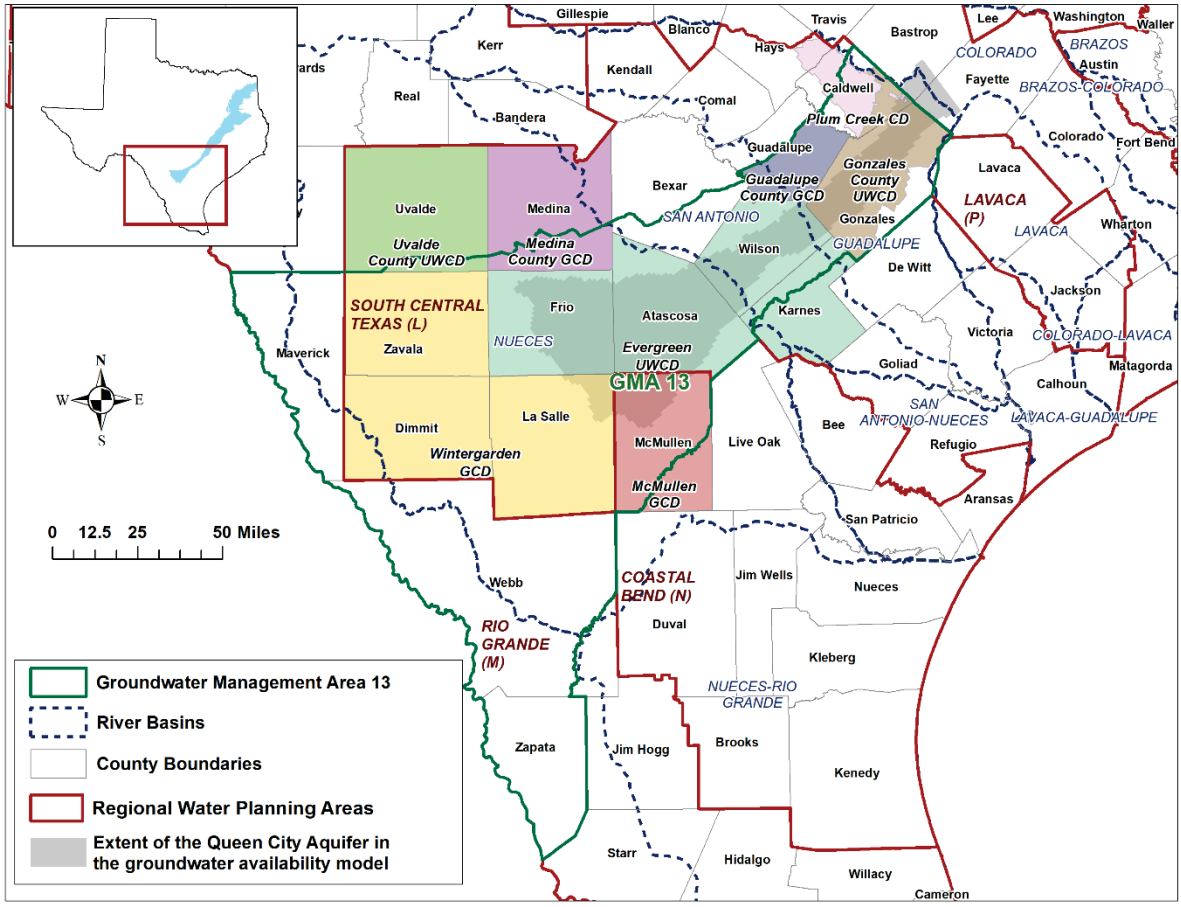


FIGURE 2. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE QUEEN CITY AQUIFER.

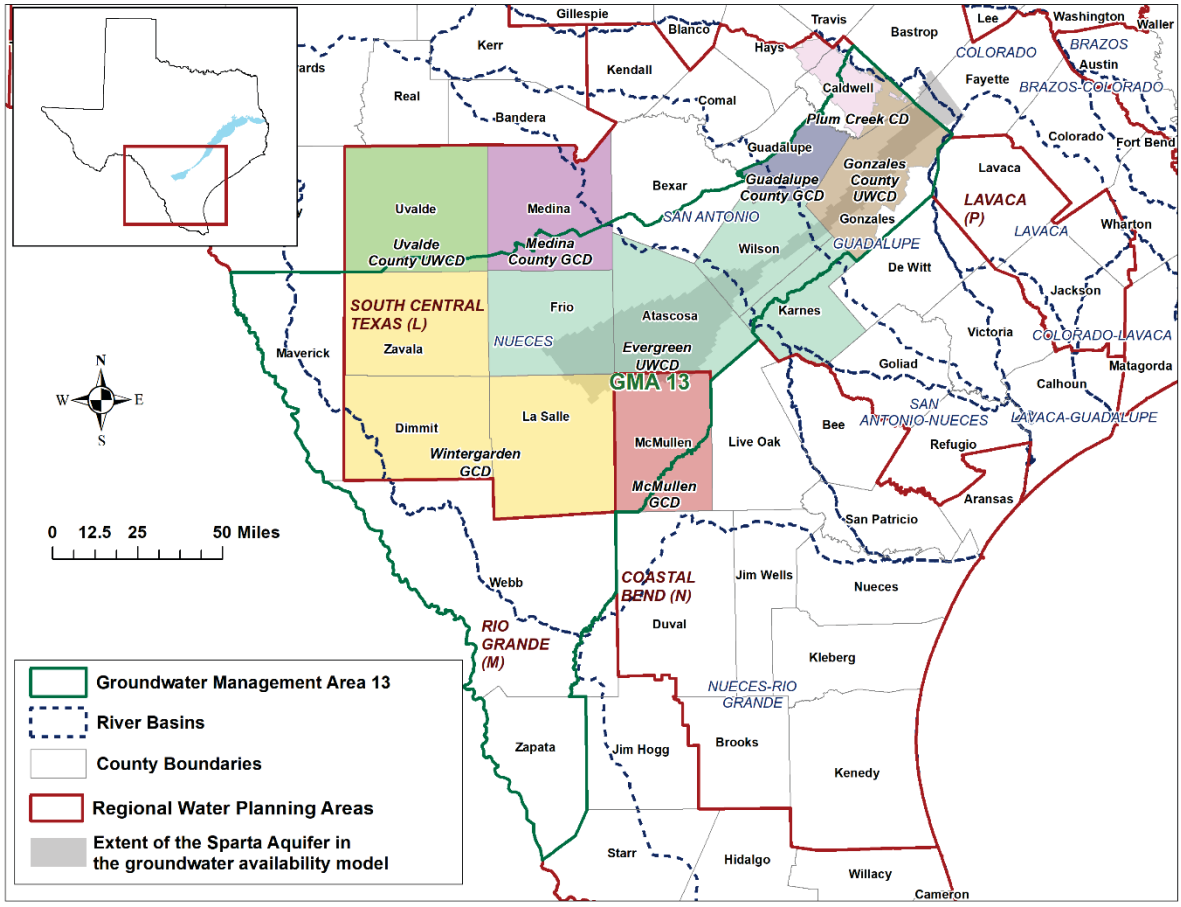


FIGURE 3. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE SPARTA AQUIFER.

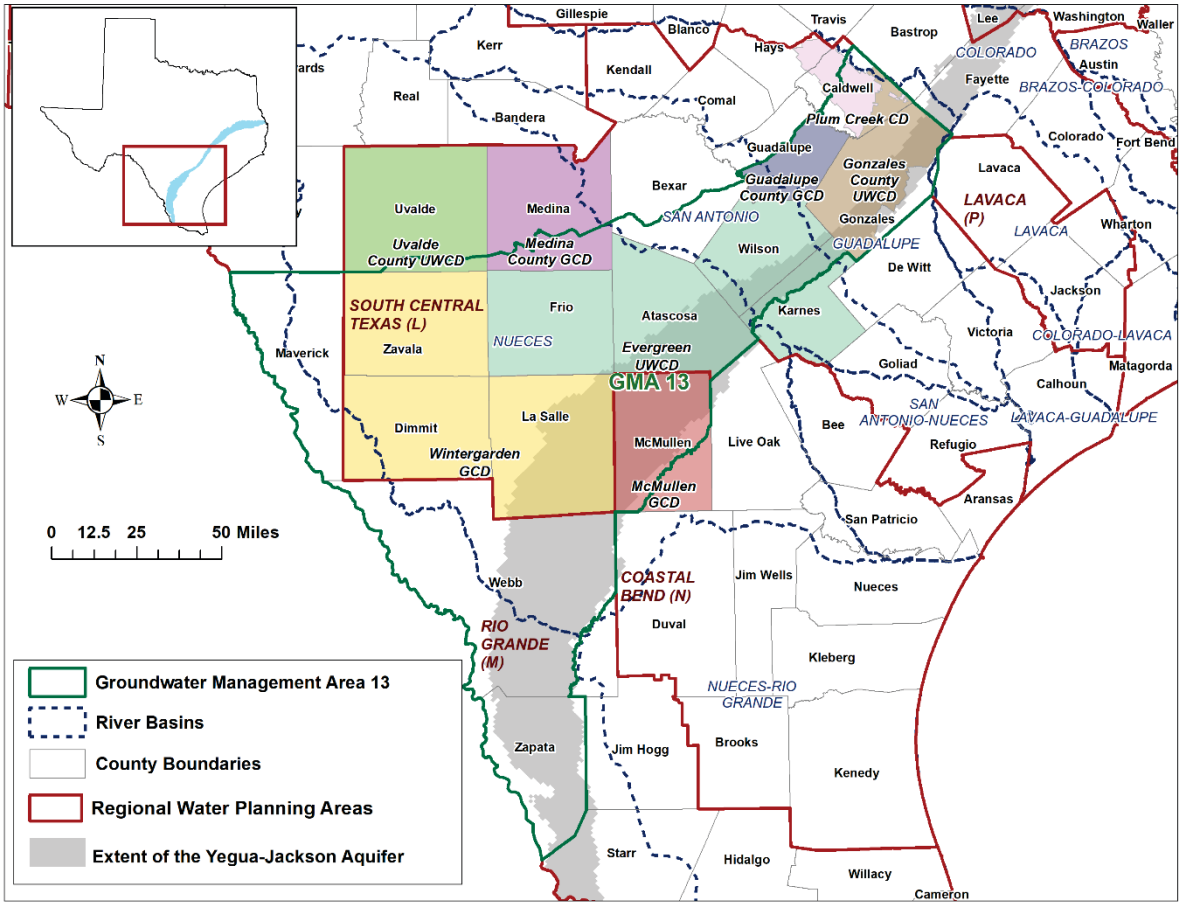


FIGURE 4. GROUNDWATER MANAGEMENT AREA (GMA) 13 BOUNDARY, REGIONAL WATER PLANNING AREAS (RWPAS), RIVER BASINS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES OVERLAIN ON THE EXTENT OF THE YEGUA-JACKSON AQUIFER.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Carrizo-Wilcox	51,924	54,397	55,329	56,828	58,406	59,982	59,982
Evergreen UWCD	Frio	Carrizo-Wilcox	114,827	86,995	85,143	82,950	81,018	79,131	79,131
Evergreen UWCD	Karnes	Carrizo-Wilcox	693	758	843	931	1,001	1,043	1,043
Evergreen UWCD	Wilson	Carrizo-Wilcox	38,229	38,284	43,604	68,609	105,947	125,670	125,670
Evergreen UWCD Total		**Carrizo-Wilcox**	**205,673**	**180,434**	**184,919**	**209,318**	**246,372**	**265,826**	**265,826**
Gonzales County UWCD	Caldwell	Carrizo-Wilcox	468	9,472	16,401	25,510	30,087	30,087	30,087
Gonzales County UWCD	Gonzales	Carrizo-Wilcox	60,431	76,265	90,788	102,373	102,747	103,707	96,161
Gonzales County UWCD Total		**Carrizo-Wilcox**	**60,899**	**85,737**	**107,189**	**127,883**	**132,834**	**133,794**	**126,248**
Guadalupe County GCD	**Guadalupe**	**Carrizo-Wilcox**	**55,637**	**39,563**	**41,668**	**43,315**	**42,118**	**42,199**	**41,659**
McMullen GCD	**McMullen**	**Carrizo-Wilcox**	**7,789**	**7,768**	**4,867**	**4,854**	**4,854**	**4,854**	**4,854**
Medina County GCD	**Medina**	**Carrizo-Wilcox**	**2,635**	**2,628**	**2,635**	**2,628**	**2,628**	**2,628**	**2,628**
Plum Creek CD	**Caldwell**	**Carrizo-Wilcox**	**17,673**	**15,366**	**16,335**	**16,965**	**15,562**	**19,509**	**19,468**
Uvalde County UWCD	**Uvalde**	**Carrizo-Wilcox**	**0**[1]	**0**	**0**	**0**	**0**	**0**	**0**

[1] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 1 (CONTINUED)

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Wintergarden GCD	Dimmit	Carrizo-Wilcox	**3,895**	**3,885**	**3,895**	**3,885**	**3,885**	**3,885**	**3,885**
Wintergarden GCD	La Salle	Carrizo-Wilcox	**6,554**	**6,536**	**6,554**	**6,536**	**6,536**	**6,536**	**6,536**
Wintergarden GCD	Zavala	Carrizo-Wilcox	**38,303**	**36,675**	**35,399**	**35,204**	**35,006**	**34,831**	**34,540**
Wintergarden GCD Total		**Carrizo-Wilcox**	**48,752**	**47,096**	**45,848**	**45,625**	**45,427**	**45,252**	**44,961**
No District-County	Bexar	Carrizo-Wilcox	69,727	68,451	68,928	68,739	67,653	67,849	67,849
No District-County	Caldwell	Carrizo-Wilcox	39	39	39	39	39	39	39
No District-County	Gonzales	Carrizo-Wilcox	0[2]	0	0	0	0	0	0
No District-County	Maverick	Carrizo-Wilcox	547	545	547	545	545	276	276
No District-County	Webb	Carrizo-Wilcox	912	910	912	910	910	910	910
No District-County Total		**Carrizo-Wilcox**	**71,225**	**69,945**	**70,426**	**70,233**	**69,147**	**69,074**	**69,074**
Total for GMA 13		**Carrizo-Wilcox**	**470,283**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[2] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Queen City	4,070	4,525	4,537	4,495	4,390	4,285	4,285
Evergreen UWCD	Frio	Queen City	6,702	4,533	4,380	4,231	4,066	3,927	3,927
Evergreen UWCD	Wilson	Queen City	2,631	1,423	1,267	1,123	1,000	892	892
Evergreen UWCD Total		**Queen City**	**13,403**	**10,481**	**10,184**	**9,849**	**9,456**	**9,104**	**9,104**
Gonzales County UWCD	Caldwell	Queen City	4,842	4,829	4,557	4,545	4,545	3,977	3,977
Gonzales County UWCD	Gonzales	Queen City	4,973	4,960	4,973	4,960	4,960	4,500	4,500
Gonzales County UWCD Total		**Queen City**	**9,815**	**9,789**	**9,530**	**9,505**	**9,505**	**8,477**	**8,477**
Guadalupe County GCD	**Guadalupe**	**Queen City**	**0**[3]	**0**	**0**	**0**	**0**	**0**	**0**
McMullen GCD	**McMullen**	**Queen City**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Plum Creek CD	**Caldwell**	**Queen City**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	**La Salle**	**Queen City**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Total for GMA 13		**Queen City**	**23,222**	**20,274**	**19,718**	**19,358**	**18,965**	**17,585**	**17,585**

[3] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Sparta	1,218	1,187	1,043	998	961	932	932
Evergreen UWCD	Frio	Sparta	897	623	603	576	557	534	534
Evergreen UWCD	Wilson	Sparta	335	182	163	144	128	114	114
Evergreen UWCD Total		**Sparta**	**2,450**	**1,992**	**1,809**	**1,718**	**1,646**	**1,580**	**1,580**
Gonzales County UWCD	**Gonzales**	**Sparta**	**3,524**	**2,451**	**2,457**	**2,451**	**2,451**	**2,451**	**2,451**
McMullen GCD	**McMullen**	**Sparta**	**0**[4]	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	**La Salle**	**Sparta**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total for GMA 13		**Sparta**	**5,974**	**4,443**	**4,266**	**4,169**	**4,097**	**4,031**	**4,031**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 13 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Karnes	Yegua-Jackson	2,013	2,013	2,013	2,013	2,013	2,013	2,013
Gonzales County UWCD	Gonzales	Yegua-Jackson	4,155	4,155	4,155	4,155	4,155	4,155	4,155
No District-County	Gonzales	Yegua-Jackson	573	573	573	573	573	573	573
Total for GMA 13		**Yegua-Jackson**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**

[4] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 5. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Carrizo-Wilcox	54,310	55,241	56,739	58,316	59,890	59,890
Atascosa	L	San Antonio	Carrizo-Wilcox	87	88	89	90	92	92
Bexar	L	Nueces	Carrizo-Wilcox	38,762	38,993	39,134	39,134	39,287	39,287
Bexar	L	San Antonio	Carrizo-Wilcox	29,689	29,935	29,605	28,519	28,562	28,562
Caldwell	L	Colorado	Carrizo-Wilcox	0[5]	0	0	0	0	0
Caldwell	L	Guadalupe	Carrizo-Wilcox	24,877	32,775	42,514	45,688	49,635	49,594
Dimmit	L	Nueces	Carrizo-Wilcox	3,765	3,775	3,765	3,765	3,765	3,765
Dimmit	L	Rio Grande	Carrizo-Wilcox	120	120	120	120	120	120
Frio	L	Nueces	Carrizo-Wilcox	86,995	85,143	82,950	81,018	79,131	79,131
Gonzales	L	Guadalupe	Carrizo-Wilcox	76,265	90,788	102,373	102,747	103,707	96,161
Gonzales	L	Lavaca	Carrizo-Wilcox	0	0	0	0	0	0
Guadalupe	L	Guadalupe	Carrizo-Wilcox	32,400	34,200	35,631	34,655	34,736	34,345
Guadalupe	L	San Antonio	Carrizo-Wilcox	7,163	7,468	7,684	7,463	7,463	7,314
Karnes	L	Guadalupe	Carrizo-Wilcox	0	0	0	0	0	0
Karnes	L	Nueces	Carrizo-Wilcox	0	0	0	0	0	0
Karnes	L	San Antonio	Carrizo-Wilcox	758	843	931	1,001	1,043	1,043
La Salle	L	Nueces	Carrizo-Wilcox	6,536	6,554	6,536	6,536	6,536	6,536
Medina	L	Nueces	Carrizo-Wilcox	2,623	2,630	2,623	2,623	2,623	2,623

[5] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 5 (CONTINUED)

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Medina	L	San Antonio	Carrizo-Wilcox	5	5	5	5	5	5
Uvalde	L	Nueces	Carrizo-Wilcox	0[6]	0	0	0	0	0
Wilson	L	Guadalupe	Carrizo-Wilcox	443	653	762	3,870	3,982	3,982
Wilson	L	Nueces	Carrizo-Wilcox	10,774	11,171	11,578	12,027	12,546	12,546
Wilson	L	San Antonio	Carrizo-Wilcox	27,067	31,780	56,269	90,050	109,142	109,142
Zavala	L	Nueces	Carrizo-Wilcox	36,675	35,399	35,204	35,006	34,831	34,540
Maverick	M	Nueces	Carrizo-Wilcox	542	544	542	542	273	273
Maverick	M	Rio Grande	Carrizo-Wilcox	3	3	3	3	3	3
Webb	M	Nueces	Carrizo-Wilcox	890	892	890	890	890	890
Webb	M	Rio Grande	Carrizo-Wilcox	20	20	20	20	20	20
McMullen	N	Nueces	Carrizo-Wilcox	7,768	4,867	4,854	4,854	4,854	4,854
GMA 13 Total			**Carrizo-Wilcox**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[6] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 6. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Queen City	4,525	4,537	4,495	4,390	4,285	4,285
Caldwell	L	Guadalupe	Queen City	4,829	4,557	4,545	4,545	3,977	3,977
Frio	L	Nueces	Queen City	4,533	4,380	4,231	4,066	3,927	3,927
Gonzales	L	Guadalupe	Queen City	4,960	4,973	4,960	4,960	4,500	4,500
Guadalupe	L	Guadalupe	Queen City	0[7]	0	0	0	0	0
La Salle	L	Nueces	Queen City	1	1	1	1	1	1
Wilson	L	Guadalupe	Queen City	106	95	84	75	67	67
Wilson	L	Nueces	Queen City	181	161	143	127	114	114
Wilson	L	San Antonio	Queen City	1,136	1,011	896	798	711	711
McMullen	N	Nueces	Queen City	3	3	3	3	3	3
GMA 13 Total			**Queen City**	**20,274**	**19,718**	**19,358**	**18,965**	**17,585**	**17,585**

[7] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 7. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Sparta	1,187	1,043	998	961	932	932
Frio	L	Nueces	Sparta	623	603	576	557	534	534
Gonzales	L	Guadalupe	Sparta	2,451	2,457	2,451	2,451	2,451	2,451
La Salle	L	Nueces	Sparta	0[8]	0	0	0	0	0
Wilson	L	Guadalupe	Sparta	12	11	10	9	8	8
Wilson	L	Nueces	Sparta	19	17	15	13	12	12
Wilson	L	San Antonio	Sparta	151	135	119	106	94	94
McMullen	N	Nueces	Sparta	0	0	0	0	0	0
GMA 13 Total			**Sparta**	**4,443**	**4,266**	**4,169**	**4,097**	**4,031**	**4,031**

[8] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE 8. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.

County	RWPA	River Basin	Aquifer	2030	2040	2050	2060	2070	2080
Atascosa	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Frio	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Gonzales	L	Guadalupe	Yegua-Jackson	4,709	4,709	4,709	4,709	4,709	4,709
Gonzales	L	Lavaca	Yegua-Jackson	19	19	19	19	19	19
Karnes	L	Guadalupe	Yegua-Jackson	292	292	292	292	292	292
Karnes	L	Nueces	Yegua-Jackson	91	91	91	91	91	91
Karnes	L	San Antonio	Yegua-Jackson	1,630	1,630	1,630	1,630	1,630	1,630
La Salle	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	Guadalupe	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Wilson	L	San Antonio	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Webb	M	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Webb	M	Rio Grande	Yegua-Jackson	NR	NR	NR	NR	NR	NR
Zapata	M	Rio Grande	Yegua-Jackson	NR	NR	NR	NR	NR	NR
McMullen	N	Nueces	Yegua-Jackson	NR	NR	NR	NR	NR	NR
GMA 13 Total			**Yegua-Jackson**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**	**6,741**

NR: Groundwater Management Area 13 declared the Yegua-Jackson Aquifer not relevant in these areas.

LIMITATIONS:

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

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

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

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

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

REFERENCES:

Deeds, N., Kelley, V., Fryar, D., Jones, T., Whallon, A.J., and Dean, K.E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.texas.gov/groundwater/models/gam/czwx_s/CZWX_S_Full_Report.pdf.

Deeds, N. E., Yan, T., Singh, A., Jones, T. L., Kelley, V. A., Knox, P. R., and Young, S. C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p., http://www.twdb.texas.gov/groundwater/models/gam/ygjk/YGJK_Model_Report.pdf.

Furnans, J., 2022, Technical Memorandum: Groundwater Availability Modeling Technical Elements, Memo to Groundwater Management Area 13, 5p.

Groundwater Management Area 13 Joint Planning Committee, Furnans, J., and Keester, M., 2022, 2021 Joint Planning Desired Future Conditions Explanatory Report, 510 p.

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Harbaugh, A.W. and McDonald, M.G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey Modular Finite-Difference Ground-Water Flow Model: U.S. Geological Survey, Open-File Report 96-485.

Harbaugh, A. W., Banta, E. R., Hill, M. C., and McDonald, M. G., 2000, MODFLOW-2000, the U.S. Geological Survey modular ground-water model -- User guide to modularization concepts and the Ground-Water Flow Process: U.S. Geological Survey Open-File Report 00-92, 121 p.

Hutchison, W.R., 2017a, GMA 13 Technical Memorandum 16-08 Final, Sparta, Queen City, and Carrizo-Wilcox Aquifers: Summary of Scenario 9 Drawdown and Outcrop Results, 13 p.

Hutchison, W.R., 2017b, GMA 13 Technical Memorandum 17-01 Final, Extension of GAM Calibration Period for Carrizo-Wilcox, Queen City, and Sparta Aquifers, 81p.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Oliver, W., 2010, GAM Task 10-012 Model Run Report: Texas Water Development Board, GAM Task 10-012 Report, 48 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/Task10-012.pdf

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

APPENDIX A

Total Pumping Associated with Modeled Available Groundwater Run for the Carrizo-Wilcox Aquifer Split by Model Layers for Groundwater Management Area 13

TABLE A.1. TOTAL PUMPING SPLIT BY MODEL LAYERS FROM THE MODELED AVAILABLE GROUNDWATER RUN FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 13. THE VALUES ARE SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Evergreen UWCD	Atascosa	Carrizo	50,266	52,745	53,671	55,176	56,754	58,330	58,330
Evergreen UWCD	Atascosa	Upper Wilcox	250	249	250	249	249	249	249
Evergreen UWCD	Atascosa	Middle Wilcox	224	223	224	223	223	223	223
Evergreen UWCD	Atascosa	Lower Wilcox	1,184	1,180	1,184	1,180	1,180	1,180	1,180
Evergreen UWCD	Frio	Carrizo	114,827	86,995	85,143	82,950	81,018	79,131	79,131
Evergreen UWCD	Frio	Upper Wilcox	0[9]	0	0	0	0	0	0
Evergreen UWCD	Frio	Middle Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Frio	Lower Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Carrizo	693	758	843	931	1,001	1,043	1,043
Evergreen UWCD	Karnes	Upper Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Middle Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Karnes	Lower Wilcox	0	0	0	0	0	0	0
Evergreen UWCD	Wilson	Carrizo	36,086	32,648	34,096	35,482	36,994	38,730	38,730
Evergreen UWCD	Wilson	Upper Wilcox	125	125	125	125	125	125	125
Evergreen UWCD	Wilson	Middle Wilcox	125	125	125	125	125	125	125
Evergreen UWCD	Wilson	Lower Wilcox	1,893	5,386	9,258	32,877	68,703	86,690	86,690
Evergreen UWCD Total		**Carrizo-Wilcox**	**205,673**	**180,434**	**184,919**	**209,318**	**246,372**	**265,826**	**265,826**

[9] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1. (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Gonzales County UWCD	Caldwell	Carrizo	453	9,457	16,386	25,495	30,072	30,072	30,072
Gonzales County UWCD	Caldwell	Upper Wilcox	15	15	15	15	15	15	15
Gonzales County UWCD	Caldwell	Middle Wilcox	0[10]	0	0	0	0	0	0
Gonzales County UWCD	Caldwell	Lower Wilcox	0	0	0	0	0	0	0
Gonzales County UWCD	Gonzales	Carrizo	47,131	51,908	55,242	55,832	56,206	57,166	49,620
Gonzales County UWCD	Gonzales	Upper Wilcox	0	0	0	0	0	0	0
Gonzales County UWCD	Gonzales	Middle Wilcox	11,096	15,563	20,114	24,556	24,556	24,556	24,556
Gonzales County UWCD	Gonzales	Lower Wilcox	2,204	8,794	15,432	21,985	21,985	21,985	21,985
Gonzales County UWCD Total		**Carrizo-Wilcox**	**60,899**	**85,737**	**107,189**	**127,883**	**132,834**	**133,794**	**126,248**
Guadalupe County GCD	Guadalupe	Carrizo	28,943	14,834	14,627	14,532	14,224	14,624	14,624
Guadalupe County GCD	Guadalupe	Upper Wilcox	0	0	0	0	0	0	0

[10] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Guadalupe County GCD	Guadalupe	Middle Wilcox	6,609	6,373	7,926	9,428	9,207	9,075	8,986
Guadalupe County GCD	Guadalupe	Lower Wilcox	20,085	18,356	19,115	19,355	18,687	18,500	18,049
Guadalupe County GCD Total		**Carrizo-Wilcox**	**55,637**	**39,563**	**41,668**	**43,315**	**42,118**	**42,199**	**41,659**
McMullen County GCD	McMullen	Carrizo	7,789	7,768	4,867	4,854	4,854	4,854	4,854
McMullen County GCD	McMullen	Upper Wilcox	0[11]	0	0	0	0	0	0
McMullen County GCD	McMullen	Middle Wilcox	0	0	0	0	0	0	0
McMullen County GCD	McMullen	Lower Wilcox	0	0	0	0	0	0	0
McMullen County GCD Total		**Carrizo-Wilcox**	**7,789**	**7,768**	**4,867**	**4,854**	**4,854**	**4,854**	**4,854**
Medina County GCD	Medina	Carrizo	517	515	517	515	515	515	515
Medina County GCD	Medina	Upper Wilcox	0	0	0	0	0	0	0
Medina County GCD	Medina	Middle Wilcox	1,252	1,249	1,252	1,249	1,249	1,249	1,249
Medina County GCD	Medina	Lower Wilcox	866	864	866	864	864	864	864
Medina County GCD Total		**Carrizo-Wilcox**	**2,635**	**2,628**	**2,635**	**2,628**	**2,628**	**2,628**	**2,628**
Plum Creek CD	Caldwell	Carrizo	0	1,990	5,048	5,709	6,046	9,993	9,993
Plum Creek CD	Caldwell	Upper Wilcox	0	0	0	0	0	0	0
Plum Creek CD	Caldwell	Middle Wilcox	5,733	5,717	5,733	5,717	3,977	3,977	3,936
Plum Creek CD	Caldwell	Lower Wilcox	11,940	7,659	5,554	5,539	5,539	5,539	5,539
Plum Creek CD Total		**Carrizo-Wilcox**	**17,673**	**15,366**	**16,335**	**16,965**	**15,562**	**19,509**	**19,468**

[11] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
Uvalde County GCD	Uvalde	Carrizo	0[12]	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Upper Wilcox	0	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Middle Wilcox	0	0	0	0	0	0	0
Uvalde County GCD	Uvalde	Lower Wilcox	0	0	0	0	0	0	0
Uvalde County GCD Total		**Carrizo-Wilcox**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wintergarden GCD	Dimmit	Carrizo	2,722	2,715	2,722	2,715	2,715	2,715	2,715
Wintergarden GCD	Dimmit	Upper Wilcox	993	990	993	990	990	990	990
Wintergarden GCD	Dimmit	Middle Wilcox	142	142	142	142	142	142	142
Wintergarden GCD	Dimmit	Lower Wilcox	38	38	38	38	38	38	38
Wintergarden GCD	La Salle	Carrizo	4,597	4,584	4,597	4,584	4,584	4,584	4,584
Wintergarden GCD	La Salle	Upper Wilcox	1,957	1,952	1,957	1,952	1,952	1,952	1,952
Wintergarden GCD	La Salle	Middle Wilcox	0	0	0	0	0	0	0
Wintergarden GCD	La Salle	Lower Wilcox	0	0	0	0	0	0	0
Wintergarden GCD	Zavala	Carrizo	27,969	26,368	25,065	24,897	24,699	24,524	24,233
Wintergarden GCD	Zavala	Upper Wilcox	6,329	6,312	6,329	6,312	6,312	6,312	6,312
Wintergarden GCD	Zavala	Middle Wilcox	3,683	3,673	3,683	3,673	3,673	3,673	3,673
Wintergarden GCD	Zavala	Lower Wilcox	322	322	322	322	322	322	322
Wintergarden GCD Total		**Carrizo-Wilcox**	**48,752**	**47,096**	**45,848**	**45,625**	**45,427**	**45,252**	**44,961**
No District-County	Bexar	Carrizo	43,057	42,939	43,346	43,227	43,227	43,423	43,423
No District-County	Bexar	Upper Wilcox	10	10	10	10	10	10	10
No District-County	Bexar	Middle Wilcox	58	58	58	58	58	58	58
No District-County	Bexar	Lower Wilcox	26,602	25,444	25,514	25,444	24,358	24,358	24,358

[12] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

TABLE A.1 (CONTINUED)

GCD	County	Aquifer	2020	2030	2040	2050	2060	2070	2080
No District-County	Caldwell	Carrizo	NP[13]	NP	NP	NP	NP	NP	NP
No District-County	Caldwell	Upper Wilcox	NP	NP	NP	NP	NP	NP	NP
No District-County	Caldwell	Middle Wilcox	39	39	39	39	39	39	39
No District-County	Caldwell	Lower Wilcox	0[14]	0	0	0	0	0	0
No District-County	Gonzales	Carrizo	0	0	0	0	0	0	0
No District-County	Gonzales	Upper Wilcox	0	0	0	0	0	0	0
No District-County	Gonzales	Middle Wilcox	0	0	0	0	0	0	0
No District-County	Gonzales	Lower Wilcox	0	0	0	0	0	0	0
No District-County	Maverick	Carrizo	543	541	543	541	541	272	272
No District-County	Maverick	Upper Wilcox	0	0	0	0	0	0	0
No District-County	Maverick	Middle Wilcox	2	2	2	2	2	2	2
No District-County	Maverick	Lower Wilcox	2	2	2	2	2	2	2
No District-County	Web	Carrizo	898	896	898	896	896	896	896
No District-County	Web	Upper Wilcox	13	13	13	13	13	13	13
No District-County	Web	Middle Wilcox	1	1	1	1	1	1	1
No District-County	Web	Lower Wilcox	0	0	0	0	0	0	0
No District-County Total		**Carrizo-Wilcox**	**71,225**	**69,945**	**70,426**	**70,233**	**69,147**	**69,074**	**69,074**
Total for GMA 13		**Carrizo-Wilcox**	**470,283**	**448,537**	**473,887**	**520,821**	**558,942**	**583,136**	**574,718**

[13] NP: The aquifer is not present in this part of the county.
[14] A zero value indicates the groundwater availability model pumping scenario did not include any pumping in the aquifer.

Appendix H

Estimated Historical Water Use and 2022 State Water Plan Datasets: Wintergarden

Groundwater Conservation District dated May 2, 2026

TWDB Estimated Historical Groundwater Use and 2022 State Water Plan Datasets

Wintergarden Groundwater Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Department
stephen.allen@twdb.texas.gov
(512) 463-7317
May 2, 2026

GROUNDWATER MANAGEMENT PLAN DATA

This set of water data tables (part one of a two-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each table addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan review checklist. The checklist can be found at this web address:

https://www.twdb.texas.gov/groundwater/docs/GCD/GCD_Mgmt_Plan_Checklist_2025.pdf

The five tables included in part one of this data package are:

TWDB Historical Water Use Survey (WUS)

- Estimated Historical Water Use (checklist item 2)

State Water Plan (SWP)

- Projected Surface Water Supplies (checklist item 6),
- Projected Water Demands (checklist item 7),
- Projected Water Supply Needs (checklist item 8),
- Projected Water Management Strategies (checklist item 9)

Part two of the two-part package is the groundwater availability model (GAM) run report for the district (checklist items 3 through 5). The district should have received, or will receive, this report from the TWDB Groundwater Modeling Department. Questions about the GAM can be directed to the Groundwater Modeling Team at GAM@twdb.texas.gov.

DISCLAIMER:

Data presented in these tables are the most up to date WUS and SWP data available as of 5/2/2026. Although it does not happen often, these data are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel should review the data table values and correct any discrepancies to ensure approval of their groundwater management plan.

The WUS data can be verified at this web address:

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

The 2022 SWP data can be verified by contacting WRPdatarequests@twdb.texas.gov

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

The county values in two of the SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not apportioned because district-specific values are not required to be presented in the groundwater management plan. However, a district is required to “consider” the county values in these two tables by drafting a short summary of the needs and strategies values in the groundwater management plan.

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

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

For additional questions regarding this data, please contact GWMPlans (GWMPlans@twdb.texas.gov)

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

DIMMIT COUNTY *100% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	2,436	0	4,460	0	3,130	77	10,103
	SW	0	0	0	0	564	77	641
2022	GW	2,317	0	3,693	0	3,356	81	9,447
	SW	0	0	0	0	31	81	112
2021	GW	2,059	0	1,580	0	3,609	180	7,428
	SW	0	0	0	0	182	180	362
2020	GW	2,239	0	799	0	3,038	188	6,264
	SW	0	0	88	0	920	188	1,196
2019	GW	1,841	0	5,258	0	3,648	188	10,935
	SW	0	0	584	0	827	188	1,599
2018	GW	1,878	0	10,361	0	3,406	188	15,833
	SW	0	0	1,151	0	347	188	1,686
2017	GW	2,000	0	7,421	0	2,416	179	12,016
	SW	0	0	825	0	1,065	179	2,069
2016	GW	1,998	0	3,621	0	3,022	156	8,797
	SW	0	0	402	0	593	156	1,151
2015	GW	2,053	0	6,976	0	3,353	153	12,535
	SW	0	0	775	0	202	153	1,130
2014	GW	2,042	0	8,841	0	4,323	150	15,356
	SW	0	0	982	0	230	150	1,362

LA SALLE COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	1,973	0	6,423	0	3,150	104	11,650
	SW	0	0	0	0	0	104	104
2022	GW	1,987	0	5,690	0	3,329	108	11,114
	SW	0	0	0	0	0	108	108
2021	GW	1,868	0	4,017	0	3,264	107	9,256
	SW	0	0	0	0	0	107	107
2020	GW	1,819	0	5,277	0	3,211	111	10,418
	SW	0	0	586	0	0	111	697
2019	GW	1,662	0	9,964	0	3,247	108	14,981
	SW	0	0	1,107	0	0	108	1,215
2018	GW	1,759	0	11,630	0	4,031	108	17,528
	SW	0	0	1,292	0	0	108	1,400
2017	GW	1,866	0	8,574	0	3,701	106	14,247
	SW	0	0	953	0	0	106	1,059
2016	GW	1,941	0	3,657	0	2,864	212	8,674
	SW	0	0	406	0	0	212	618
2015	GW	1,719	0	7,764	0	1,850	208	11,541
	SW	0	0	863	0	0	208	1,071
2014	GW	1,837	0	11,017	0	4,492	207	17,553
	SW	0	0	1,224	0	0	207	1,431

ZAVALA COUNTY

100% (multiplier)

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2023	GW	2,265	7	1,528	0	34,705	310	38,815
	SW	0	0	0	0	335	310	645
2022	GW	2,531	0	1,596	0	35,907	324	40,358
	SW	0	0	0	0	1,125	324	1,449
2021	GW	2,506	3	1,268	0	31,746	434	35,957
	SW	0	0	0	0	3,477	434	3,911
2020	GW	2,461	90	681	0	33,281	442	36,955
	SW	0	0	76	0	9,796	442	10,314
2019	GW	2,344	90	584	0	34,151	442	37,611
	SW	0	0	65	0	8,529	442	9,036
2018	GW	2,232	92	554	0	36,973	442	40,293
	SW	0	0	62	0	4,663	442	5,167
2017	GW	2,233	456	161	0	35,759	428	39,037
	SW	0	0	18	0	5,445	428	5,891
2016	GW	2,238	662	367	0	32,430	371	36,068
	SW	0	0	41	0	2,586	371	2,998
2015	GW	2,728	668	511	0	31,193	358	35,458
	SW	0	0	57	0	2,424	358	2,839
2014	GW	2,801	603	853	0	44,246	357	48,860
	SW	0	0	95	0	284	357	736

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

DIMMIT COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Irrigation, Dimmit	Nueces	Nueces Run-of-River	210	210	210	210	210	210
L	Livestock, Dimmit	Nueces	Nueces Livestock Local Supply	170	170	170	170	170	170
L	Livestock, Dimmit	Rio Grande	Rio Grande Livestock Local Supply	24	24	24	24	24	24
L	Mining, Dimmit	Nueces	Nueces Run-of-River	0	0	0	0	0	0
	Sum of Projected Surface Water Supplies (acre-feet)			**404**	**404**	**404**	**404**	**404**	**404**

LA SALLE COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Irrigation, La Salle	Nueces	Nueces Run-of-River	474	474	474	474	474	474
L	Livestock, La Salle	Nueces	Nueces Livestock Local Supply	245	245	245	245	245	245
	Sum of Projected Surface Water Supplies (acre-feet)			**719**	**719**	**719**	**719**	**719**	**719**

ZAVALA COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	Livestock, Zavala	Nueces	Nueces Livestock Local Supply	594	594	594	594	594	594
	Sum of Projected Surface Water Supplies (acre-feet)			**594**	**594**	**594**	**594**	**594**	**594**

Projected Water Demands
TWDB 2022 State Water Plan Data

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

DIMMIT COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Asherton	Nueces	238	249	260	271	280	287
L	Big Wells	Nueces	121	126	129	133	137	141
L	Carrizo Hill WSC	Nueces	119	125	129	134	138	141
L	Carrizo Springs	Nueces	1,623	1,717	1,773	1,846	1,904	1,952
L	County-Other, Dimmit	Nueces	307	322	328	339	349	358
L	County-Other, Dimmit	Rio Grande	3	3	4	4	4	4
L	Irrigation, Dimmit	Nueces	4,910	4,910	4,910	4,910	4,910	4,910
L	Irrigation, Dimmit	Rio Grande	691	691	691	691	691	691
L	Livestock, Dimmit	Nueces	349	349	349	349	349	349
L	Livestock, Dimmit	Rio Grande	39	39	39	39	39	39
L	Mining, Dimmit	Nueces	4,265	4,336	3,760	2,449	1,140	531
L	Mining, Dimmit	Rio Grande	654	665	577	375	175	81
	Sum of Projected Water Demands (acre-feet)		**13,319**	**13,532**	**12,949**	**11,540**	**10,116**	**9,484**

LA SALLE COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Cotulla	Nueces	1,291	1,392	1,488	1,605	1,711	1,811
L	County-Other, La Salle	Nueces	302	321	341	366	389	412
L	Encinal WSC	Nueces	214	229	243	261	279	295
L	Irrigation, La Salle	Nueces	5,784	5,784	5,784	5,784	5,784	5,784
L	Livestock, La Salle	Nueces	491	491	491	491	491	491
L	Mining, La Salle	Nueces	4,617	4,772	4,263	2,819	1,380	676
	Sum of Projected Water Demands (acre-feet)		**12,699**	**12,989**	**12,610**	**11,326**	**10,034**	**9,469**

ZAVALA COUNTY

100% (multiplier)

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Batesville WSC	Nueces	211	228	245	264	283	300
L	County-Other, Zavala	Nueces	243	262	285	309	330	351
L	Crystal City	Nueces	1,702	1,857	1,999	2,159	2,312	2,455
L	Irrigation, Zavala	Nueces	46,318	46,318	46,185	46,085	45,766	45,766
L	Livestock, Zavala	Nueces	893	893	893	893	893	893

L	Loma Alta Chula Vista Water System	Nueces	235	259	280	303	324	344
L	Manufacturing, Zavala	Nueces	603	766	766	766	766	766
L	Mining, Zavala	Nueces	2,531	2,257	1,977	1,559	932	557
L	Zavala County WCID 1	Nueces	480	527	570	616	660	701
	Sum of Projected Water Demands (acre-feet)		**53,216**	**53,367**	**53,200**	**52,954**	**52,266**	**52,133**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

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

DIMMIT COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Asherton	Nueces	0	0	0	0	0	0
L	Big Wells	Nueces	0	0	0	0	0	0
L	Carrizo Hill WSC	Nueces	0	0	0	0	0	0
L	Carrizo Springs	Nueces	0	0	0	0	0	0
L	County-Other, Dimmit	Nueces	51	36	30	19	9	0
L	County-Other, Dimmit	Rio Grande	1	1	0	0	0	0
L	Irrigation, Dimmit	Nueces	-4,636	-4,636	-4,636	-4,636	-4,636	-4,636
L	Irrigation, Dimmit	Rio Grande	-613	-613	-613	-613	-613	-613
L	Livestock, Dimmit	Nueces	0	0	0	0	0	0
L	Livestock, Dimmit	Rio Grande	0	0	0	0	0	0
L	Mining, Dimmit	Nueces	-3,570	-3,647	-3,075	-1,769	-464	142
L	Mining, Dimmit	Rio Grande	-654	-665	-577	-375	-175	-81
	Sum of Projected Water Supply Needs (acre-feet)		**-9,473**	**-9,561**	**-8,901**	**-7,393**	**-5,888**	**-5,330**

LA SALLE COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Cotulla	Nueces	1,090	989	893	776	670	570
L	County-Other, La Salle	Nueces	0	0	0	0	0	0
L	Encinal WSC	Nueces	81	66	52	34	16	0
L	Irrigation, La Salle	Nueces	-1,184	-1,203	-1,223	-1,248	-1,271	-1,294
L	Livestock, La Salle	Nueces	0	0	0	0	0	0
L	Mining, La Salle	Nueces	-4,088	-4,243	-3,734	-2,290	-851	-147
	Sum of Projected Water Supply Needs (acre-feet)		**-5,272**	**-5,446**	**-4,957**	**-3,538**	**-2,122**	**-1,441**

ZAVALA COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	Batesville WSC	Nueces	0	0	0	0	0	0
L	County-Other, Zavala	Nueces	117	98	75	51	30	9
L	Crystal City	Nueces	753	598	456	296	143	0
L	Irrigation, Zavala	Nueces	-21,235	-21,350	-21,109	-20,733	-20,148	-19,865
L	Livestock, Zavala	Nueces	0	0	0	0	0	0

L	Loma Alta Chula Vista Water System	Nueces	0	0	0	0	0	0
L	Manufacturing, Zavala	Nueces	0	0	0	0	0	0
L	Mining, Zavala	Nueces	0	0	0	0	0	0
L	Zavala County WCID 1	Nueces	860	813	770	724	680	639
	Sum of Projected Water Supply Needs (acre-feet)		**-21,235**	**-21,350**	**-21,109**	**-20,733**	**-20,148**	**-19,865**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

DIMMIT COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Asherton, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Dimmit]	7	24	47	57	65	72
		7	**24**	**47**	**57**	**65**	**72**
Big Wells, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Dimmit]	3	2	2	4	7	11
		3	**2**	**2**	**4**	**7**	**11**
Carrizo Hill WSC, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Dimmit]	2	10	11	14	17	20
		2	**10**	**11**	**14**	**17**	**20**
Carrizo Springs, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Dimmit]	77	210	346	498	645	784
		77	**210**	**346**	**498**	**645**	**784**
County-Other, Dimmit, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Dimmit]	0	0	0	0	0	2
		0	**0**	**0**	**0**	**0**	**2**
Sum of Projected Water Management Strategies (acre-feet)		**89**	**246**	**406**	**573**	**734**	**889**

LA SALLE COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Cotulla, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [La Salle]	67	180	303	443	589	737
		67	**180**	**303**	**443**	**589**	**737**
County-Other, La Salle, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [La Salle]	0	0	0	0	0	5
		0	**0**	**0**	**0**	**0**	**5**
Encinal WSC, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [La Salle]	8	25	44	58	68	77

		8	**25**	**44**	**58**	**68**	**77**
Sum of Projected Water Management Strategies (acre-feet)		**75**	**205**	**347**	**501**	**657**	**819**

ZAVALA COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Batesville WSC, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Zavala]	5	13	16	22	29	37
		5	**13**	**16**	**22**	**29**	**37**
County-Other, Zavala, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Zavala]	4	9	15	24	32	42
		4	**9**	**15**	**24**	**32**	**42**
Crystal City, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Zavala]	60	196	353	496	573	654
		60	**196**	**353**	**496**	**573**	**654**
Loma Alta Chula Vista Water System, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Zavala]	12	34	57	84	112	140
		12	**34**	**57**	**84**	**112**	**140**
Zavala County WCID 1, Nueces (L)							
Municipal Water Conservation	DEMAND REDUCTION [Zavala]	24	65	113	168	225	283
		24	**65**	**113**	**168**	**225**	**283**
Sum of Projected Water Management Strategies (acre-feet)		**105**	**317**	**554**	**794**	**971**	**1,156**

Appendix I

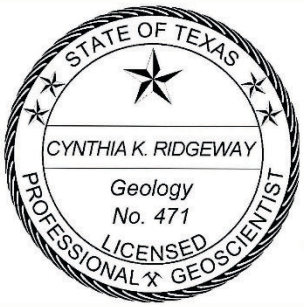
GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan

dated September 30, 2020

GAM Run 20-004: Wintergarden Groundwater Conservation District Management Plan

Jiabao Guan, Ph.D., R. Grayson Dowlearn, G.I.T. and Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 475-1522
September 30, 2020

Shirley C. Wade
9/30/20



Cynthia K. Ridgeway

Cynthia K. Ridgeway is the manager of the Groundwater Availability Modeling Department and is responsible for the oversight of work performed by Jiabao Guan and R. Grayson Dowlearn under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on September 30, 2020.

This page is intentionally blank

GAM RUN 20-004: WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

Jiabao Guan, Ph.D., R. Grayson Dowlearn, G.I.T. and Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 475-1522
September 30, 2020

EXECUTIVE SUMMARY:

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

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

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

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

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

The groundwater management plan for the Wintergarden Groundwater Conservation District should be adopted by the district on or before March 29, 2021 and submitted to the executive administrator of the TWDB on or before April 28, 2021. The current management plan for the Wintergarden Groundwater Conservation District expires on June 27, 2021.

We used three groundwater availability models to estimate the management plan information for the aquifers within Wintergarden Groundwater Conservation District. Information for the Edwards (Balcones Fault Zone) Aquifer is from version 1.01 of the Groundwater Availability Model for the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer (Lindgren and others, 2004). Information for the Carrizo-Wilcox, Queen City, and Sparta aquifers is from version 2.01 of the Groundwater Availability Model for the southern portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers (Deeds and others, 2003; Kelley and others, 2004). Information for the Yegua-Jackson Aquifer is from version 1.01 of the Groundwater Availability Model for the Yegua-Jackson Aquifer (Deeds and others, 2010).

This report replaces the results of GAM Run 15-007 (Bagans and Wade, 2015), as information for the Edwards (Balcones Fault Zone) Aquifer has been added to this report. Tables 1 through 5 summarize the groundwater availability model data required by statute, and Figures 1 through 5 show the area of the models from which the values in the tables were extracted. If, after review of the figures, the Wintergarden Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability models mentioned above were used to estimate the information for the Wintergarden Groundwater Conservation District management plan. Water Budgets were extracted for the Edwards (Balcones Fault Zone) Aquifer (1980-2000), the Carrizo-Wilcox, Queen City and Sparta Aquifers (1980-1999), and the Yegua-Jackson Aquifer (1980-1997). We used ZONEBUDGET Version 3.01 (Harbaugh, 2009) to extract water budgets from the model results. The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and the flow between aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Edwards (Balcones Fault Zone) Aquifer

- We used version 1.01 of the groundwater availability model for the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer. See Lindgren and others (2004) for assumptions and limitations of the groundwater availability model for the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer.

- This groundwater availability model includes one layer which represents the Edwards Group (Layer 1).

- Water budget was estimated by averaging over the period January1980 to December 2000 (stress periods 73 through 324).

- The model was run with MODFLOW-2000 (Harbaugh and McDonald, 2000).

Carrizo-Wilcox, Queen City and Sparta Aquifers

- We used version 2.01 of the groundwater availability model for the southern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Deeds and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the southern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers.

- This groundwater availability model includes eight layers which generally represent the Sparta Aquifer (Layer 1), the Weches Confining Unit (Layer 2), the Queen City Aquifer (Layer 3), the Reklaw Confining Unit (Layer 4), the Carrizo Aquifer (Layer 5), the Upper Wilcox (Layer 6), the Middle Wilcox (Layer 7), and the Lower Wilcox (Layer 8). Water budgets were extracted collectively for the Carrizo-Wilcox Aquifer (Layer 5 through Layer 8), and separately for Queen City Aquifer (Layer 3) and Sparta Aquifer (Layer 1).

- Groundwater in the Carrizo-Wilcox, Queen City, and Sparta aquifers ranges from fresh to brackish in composition (Kelley and others, 2004). Groundwater with total dissolved solids of less than 1,000 milligrams per liter are considered fresh and total dissolved solids of 1,000 to 10,000 milligrams per liter are considered brackish.

- Water budgets were estimated by averaging over the period 1980 to 1999 (stress periods 6 through 25).

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

Yegua-Jackson Aquifer

- We used version 1.01 of the groundwater availability model for the Yegua-Jackson aquifer. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model for the Yegua-Jackson aquifers.
- This groundwater availability model includes five layers which represent the outcrop section for the Yegua-Jackson Aquifer and younger overlying units – the Catahoula Formation (Layer 1), the upper portion of Jackson Group (Layer 2), the lower portion of the Jackson Group (Layer 3), the upper portion of Yegua Group (Layer 4), and the lower portion of Yegua Group (Layer 5).
- An overall water budget for the district was extracted collectively for the Yegua-Jackson Aquifer (Layer 1 through Layer 5).
- Water budgets were estimated by averaging over the period 1980 to 1997 (stress periods 10 through 27).
- The model was run with MODFLOW-2000 (Harbaugh and McDonald, 2000).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the aquifers located within the district and averaged over the historical calibration periods, as shown in Tables 1 through 5.

1. Precipitation recharge – the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
2. Surface water outflow – the total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and springs.
3. Flow into and out of the district – the lateral flow within the aquifer between the district and adjacent counties.
4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in Tables 1 through 5. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

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

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers, and drains	Edwards (Balcones Fault Zone) Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	13,715
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	10,777
Estimated net annual volume of flow between each aquifer in the district*	From the Edwards (Balcones Fault Zone) Aquifer to the brackish portion of the Edwards Group	2,939

*The groundwater availability model for the Edwards (Balcones Fault Zone) Aquifer assumes no-flow conditions at the base of the aquifer unit.

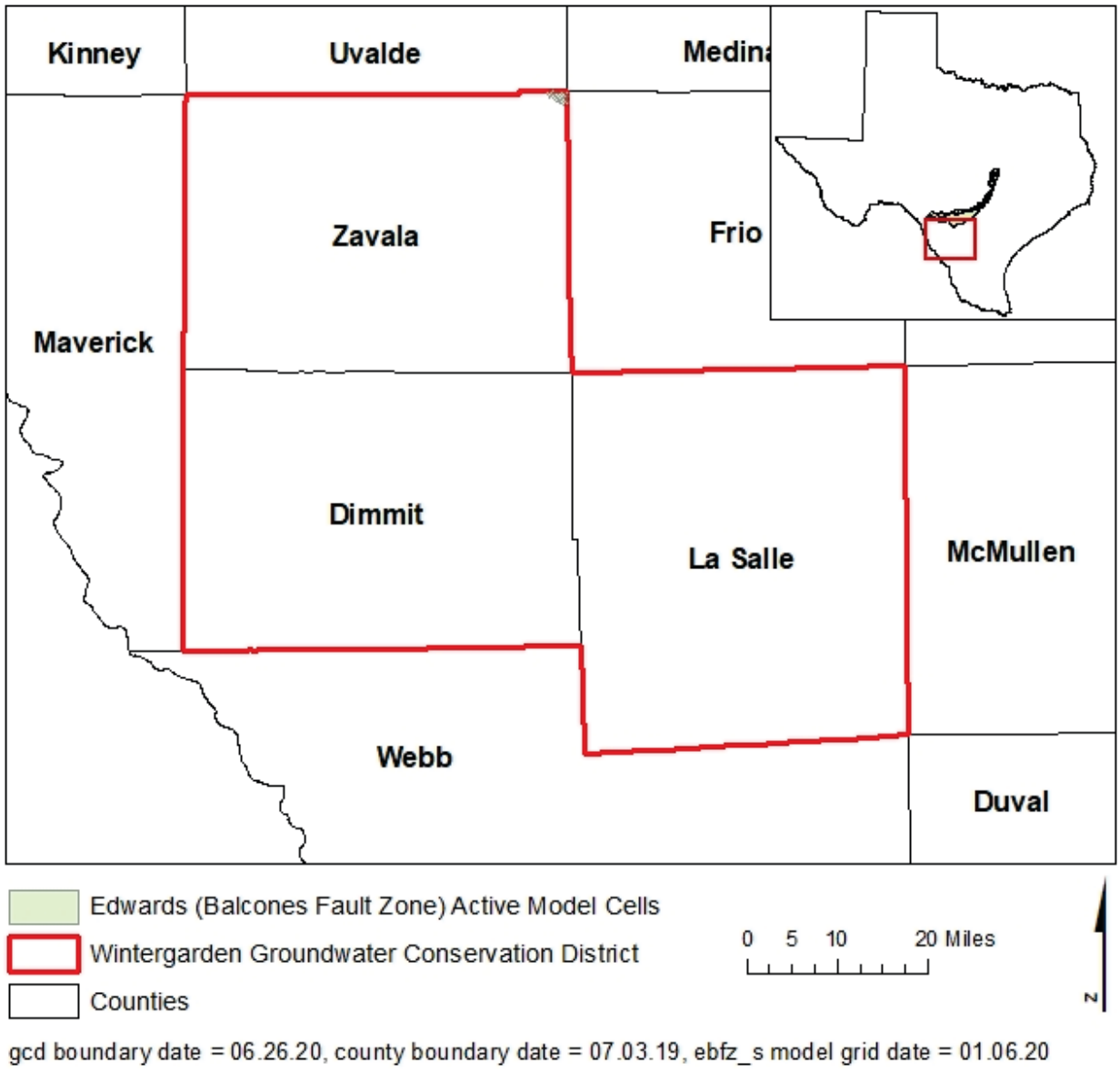


FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SAN ANTONIO SEGMENT OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE EDWARDS (BALCONES FAULT ZONE) AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2: SUMMARIZED INFORMATION FOR THE CARRIZO-WILCOX AQUIFER THAT IS NEEDED FOR THE WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	14,891
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers, and drains	Carrizo-Wilcox Aquifer	329
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	25,230
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	22,567
Estimated net annual volume of flow between each aquifer in the district*	Into the Carrizo-Wilcox Aquifer from the Reklaw Confining Unit	28,228

*The groundwater availability model for the southern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers assumes no-flow conditions at the base of the Carrizo-Wilcox Aquifer unit.

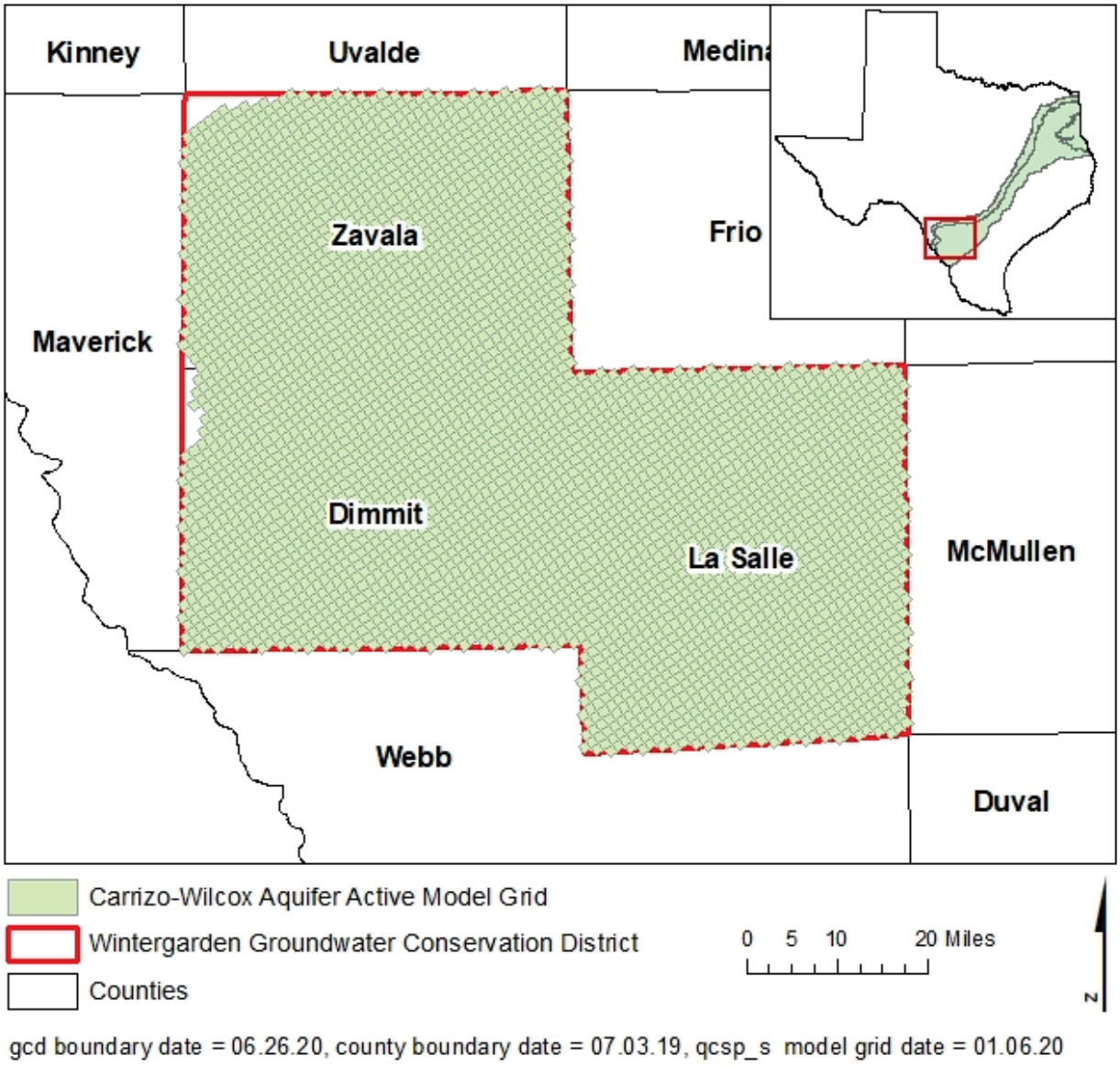


FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SOUTHERN PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE CARRIZO-WILCOX AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 3: SUMMARIZED INFORMATION FOR THE QUEEN CITY AQUIFER THAT IS NEEDED FOR THE WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Queen City Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	684
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	168
Estimated net annual volume of flow between each aquifer in the district	From Queen City Aquifer into the Weches Confining Unit	382
	From Queen City Aquifer into the Reklaw Confining Unit	449
	Into the Queen City Aquifer from the brackish portion of the Queen City Formation	159

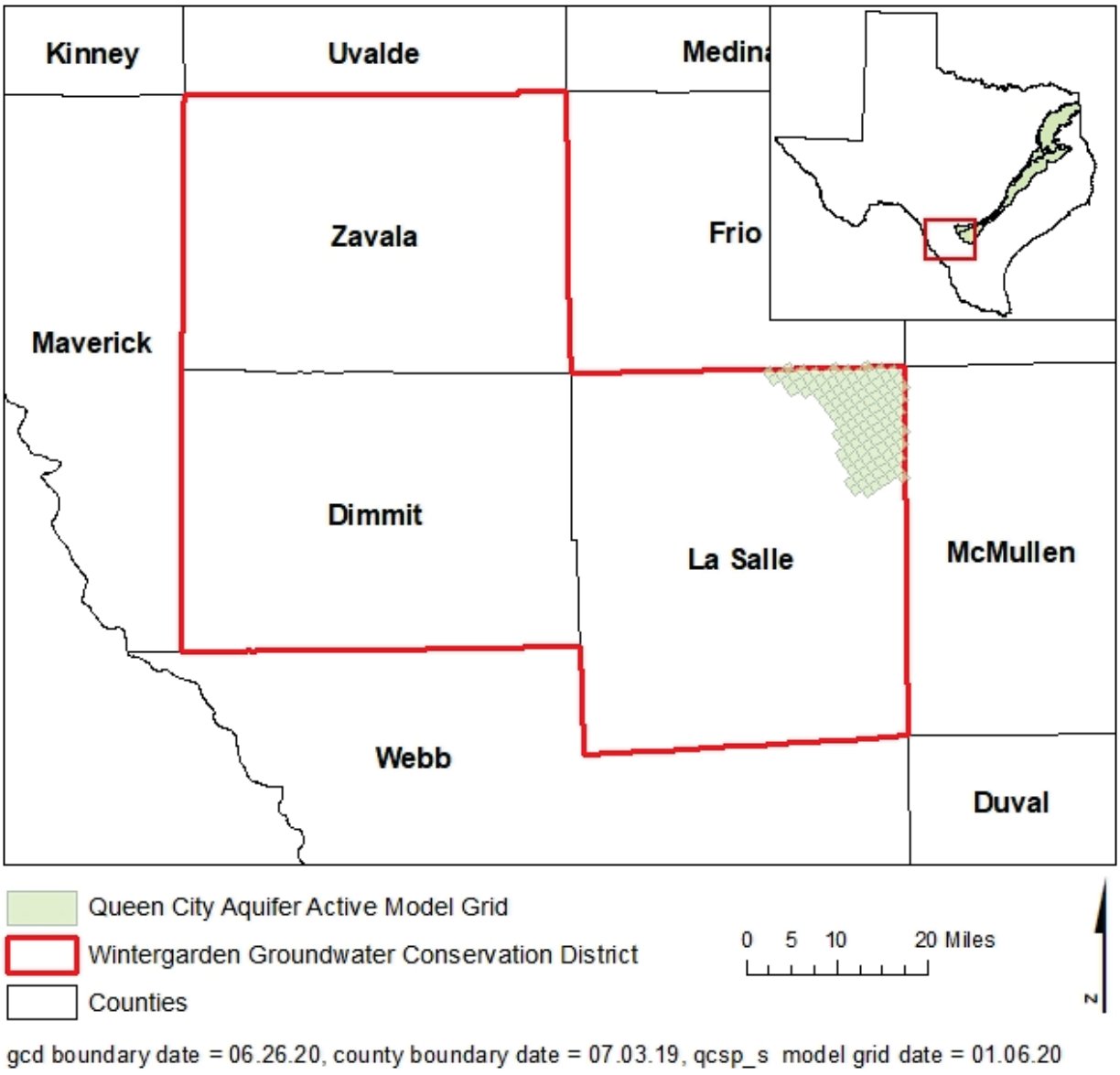


FIGURE 3: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SOUTHERN PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (THE QUEEN CITY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 4: SUMMARIZED INFORMATION FOR THE SPARTA AQUIFER THAT IS NEEDED FOR THE WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Sparta Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Sparta Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Sparta Aquifer	591
Estimated annual volume of flow out of the district within each aquifer in the district	Sparta Aquifer	27
Estimated net annual volume of flow between each aquifer in the district	Into Sparta Aquifer from the overlying younger units	69
	Into Sparta Aquifer from the underlying Weches Confining Unit	24
	From the Sparta Aquifer into the brackish portion of the Sparta Formation	379

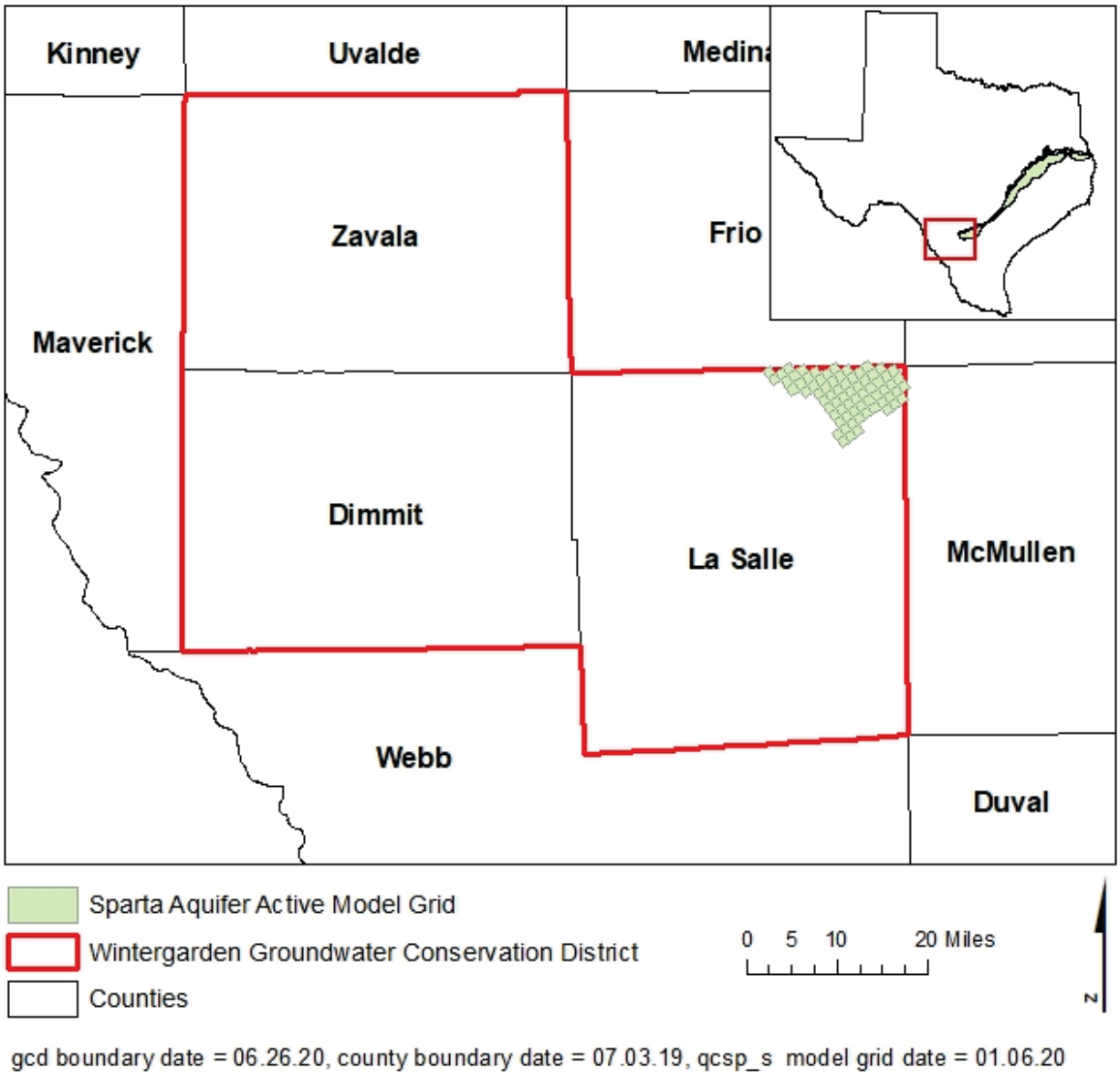


FIGURE 4: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SOUTHERN PORTION OF THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS FROM WHICH THE INFORMATION IN TABLE 4 WAS EXTRACTED (THE SPARTA AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 5: SUMMARIZED INFORMATION FOR THE YEGUA-JACKSON AQUIFER THAT IS NEEDED FOR THE WINTERGARDEN GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Yegua-Jackson Aquifer	7,619
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Yegua-Jackson Aquifer	8,190
Estimated annual volume of flow into the district within each aquifer in the district	Yegua-Jackson Aquifer	2,717
Estimated annual volume of flow out of the district within each aquifer in the district	Yegua-Jackson Aquifer	2,671
Estimated net annual volume of flow between each aquifer in the district	Not applicable*	Not applicable*

*The groundwater availability model for the Yegua-Jackson Aquifer assumes no-flow conditions at the base of the aquifer unit.

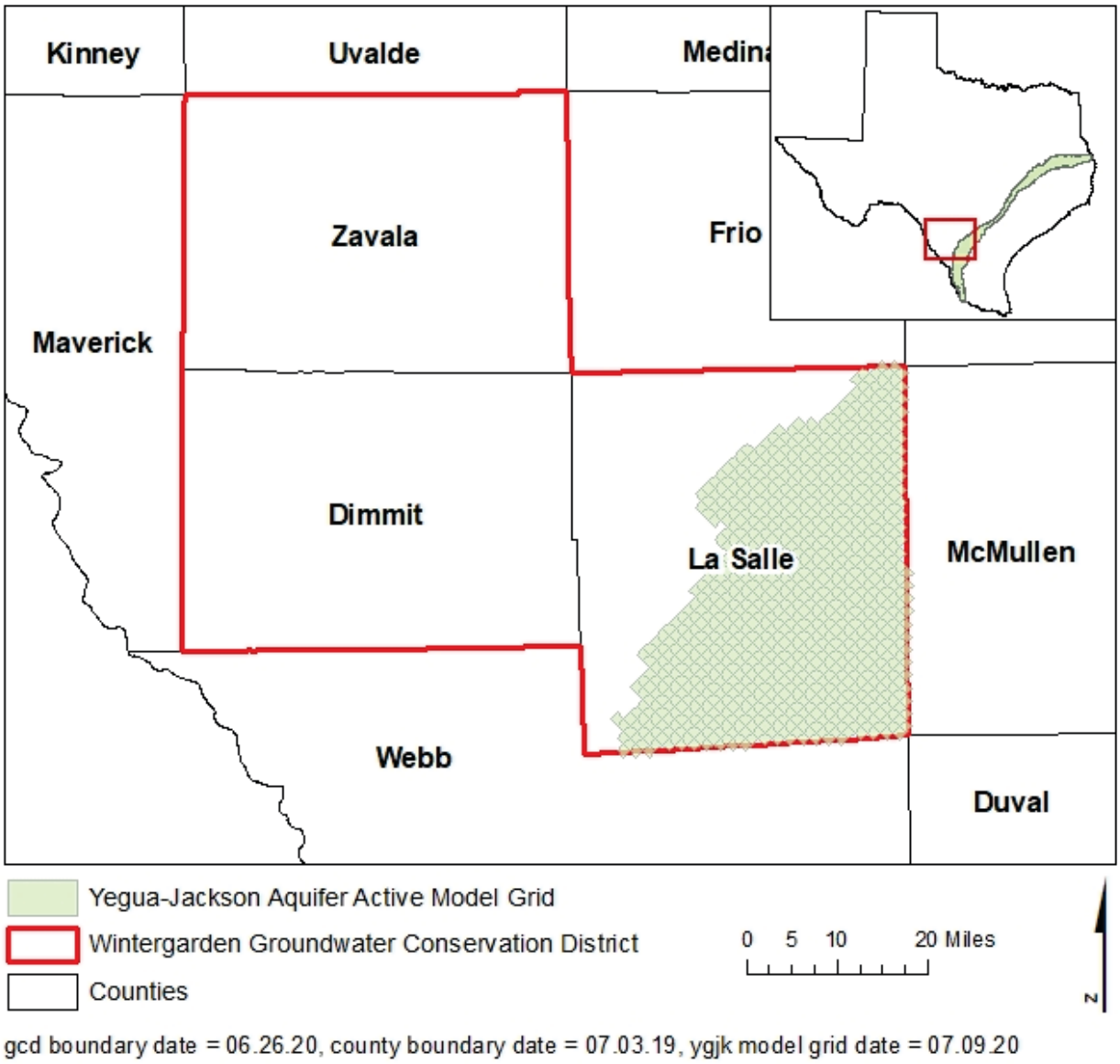


FIGURE 5: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE YEGUA-JACKSON AQUIFER FROM WHICH THE INFORMATION IN TABLE 5 WAS EXTRACTED (THE YEGUA-JACKSON AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

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

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

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

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

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

REFERENCES:

Bagans, R.C., and Wade, S., 2015, GAM Run 15-007: Wintergarden Groundwater Conservation District Management Plan, 16 p., https://www.twdb.texas.gov/groundwater/docs/GAMruns/GR15-007.pdf

Deeds, N., Kelley, V., Fryar, D., Jones, T., Whallon, A.J., and Dean, K.E., 2003, Groundwater Availability Model for the Southern Carrizo-Wilcox Aquifer: Contract report to the Texas Water Development Board, 452 p., http://www.twdb.texas.gov/groundwater/models/gam/czwx_s/CZWX_S_Full_Report.pdf.

Deeds, N.E., Yan, T., Singh, A., Jones, T.L., Kelley, V.A., Knox, P.R., Young, S.C., 2010, Groundwater Availability Model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p., http://www.twdb.texas.gov/groundwater/models/gam/ygjk/YGJK_Model_Report.pdf.

Harbaugh, A.W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Harbaugh, A.W., and McDonald, M.G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference groundwater-water flow model: U.S. Geological Survey Open-File Report 96-485, 56 p.

Harbaugh, A.W., Banta, E.R., Hill, M.C., and McDonald, M.G., 2000, MODFLOW-2000, The U.S. Geological Survey modular ground-water model – User guide to modularization concepts and the ground-water flow process: U.S. Geological Survey, Open-File Report 00-92, 130 p.

Kelley, V.A., Deeds, N.E., Fryar, D.G., and Nicot, J.P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p., https://www.twdb.texas.gov/groundwater/models/gam/qcsp/QCSP_Model_Report.pdf.

Lindgren, R.J., Dutton, A.R., Hovorka, S.D., Worthington, S.R.H., and Painter, S., 2004, Conceptualization and Simulation of the Edwards Aquifer, San Antonio Region, Texas, U.S. Geological Survey Scientific Investigations Report 2004–5277, 153 p., https://www.twdb.texas.gov/groundwater/models/gam/ebfz_s/USGS_SIR2004-5277.pdf.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

Appendix J

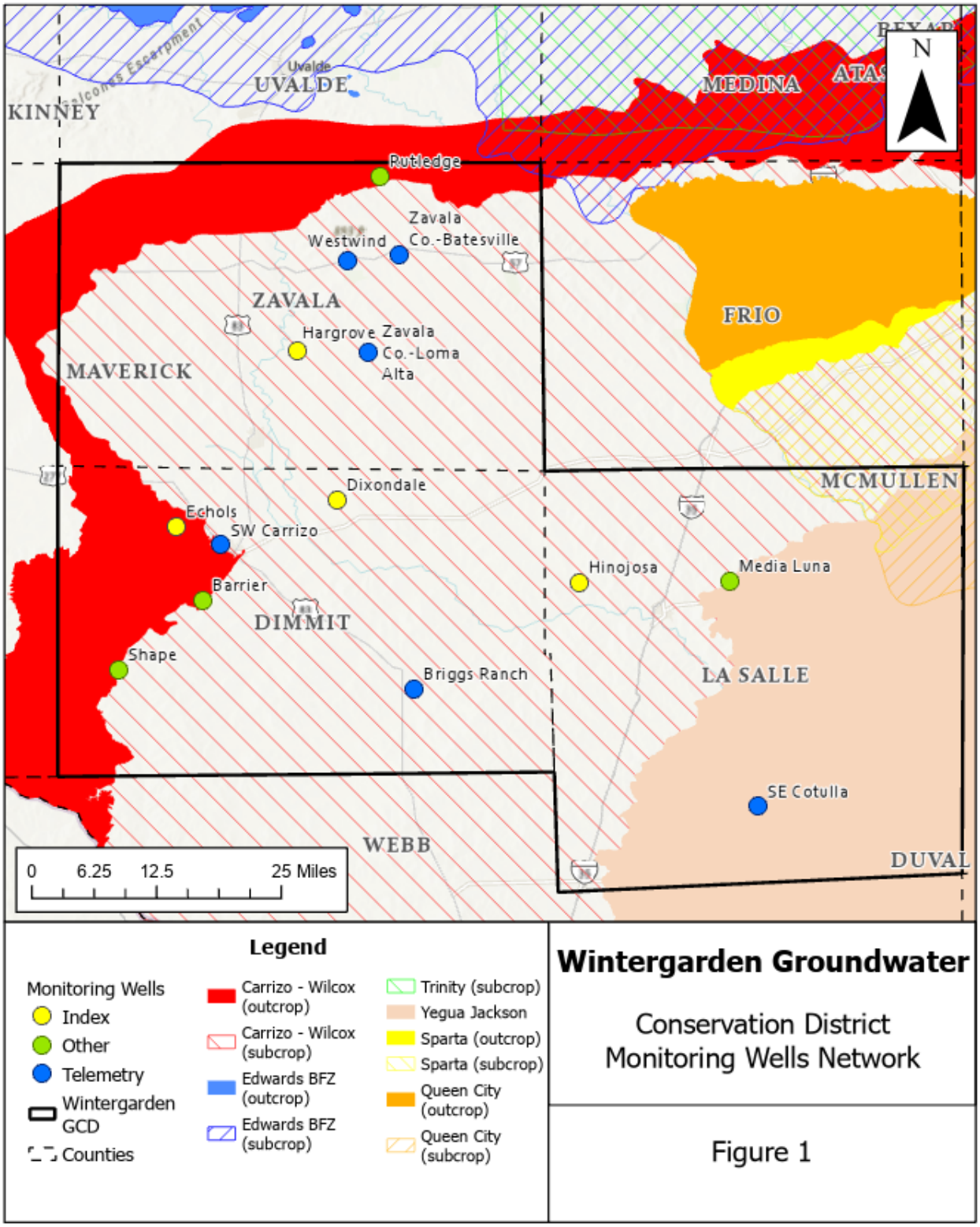
District Monitoring Well Network

Appendix J

Table 1. District Monitoring Well Network

Well Name	Type of well	Latitude	Longitude	County	Aquifer Type	Location
Barrier	Non-telemetry	28º 27' 13	99º 54' 13	Dimmit	Outcrop	5 mi. SW of Carrizo Springs
Dixondale	Index	28º 35' 54.70	99º 42' 32.84	Dimmit	Subcrop	3 mi. West of Brundage
Echols	Index	28º 33' 35.1"	99º 56' 29.3"	LaSalle	Subcrop	8 mi. NNE of Los Angeles
Hargrove	Index	28º 48' 53.6"	99º 46' 02.0"	Zavala	Subcrop	12 mi. NE of Crystal City
Hinojosa	Index	28º 28' 46.90	99º 21' 29.52	LaSalle	Subcrop	8 mi. West of Cotulla
Media Luna	Non-telemetry	28º 28' 54.53	99º 8' 25.67	LaSalle	Subcrop	4 mi. East of Cotulla
Rutledge	Non-telemetry	29º 04' 03.3"	99º 38' 49.0"	Zavala	Outcrop	8 mi. North of Batesville
Shape	Non-telemetry	28º 21' 12.3"	100º 01' 35.0"	Dimmit	Subcrop	18 mi. SW of Carrizo Springs
SW Carrizo	Telemetry	28º 32’ 03”	99º 52’ 44”	Dimmit	Outcrop	1.2 mi. SW of Carrizo Springs
Briggs Ranch	Telemetry	28º 19’ 30”	99º 35’ 50”	Dimmit	Subcrop	3 mi. S of Catarina
SE Cotulla	Telemetry	28º 9’ 17.4”	99º 5’ 59”	La Salle	Subcrop	30 mi. SE of Cotulla
Westwind	Telemetry	28º 56’ 46”	99º 41’ 40”	Zavala	Subcrop	5.5 mi. of Batesville
Zavala Co.-Loma Alta	Telemetry	28º 48’ 43.2”	99º 39’ 47”	Zavala	Subcrop	1 mi. SE of Crystal City
Zavala Co.-Batesville	Telemetry	28º 57’ 15”	99º 37’ 07”	Zavala	Subcrop	Hwy. 117, Batesville

Figure 1. District Monitoring Well Network Map



Appendix K

Well Trend Analysis & DFC Compliance Calculations

Appendix K

Figure 1. Well Trend Analysis for Monitoring Well Network

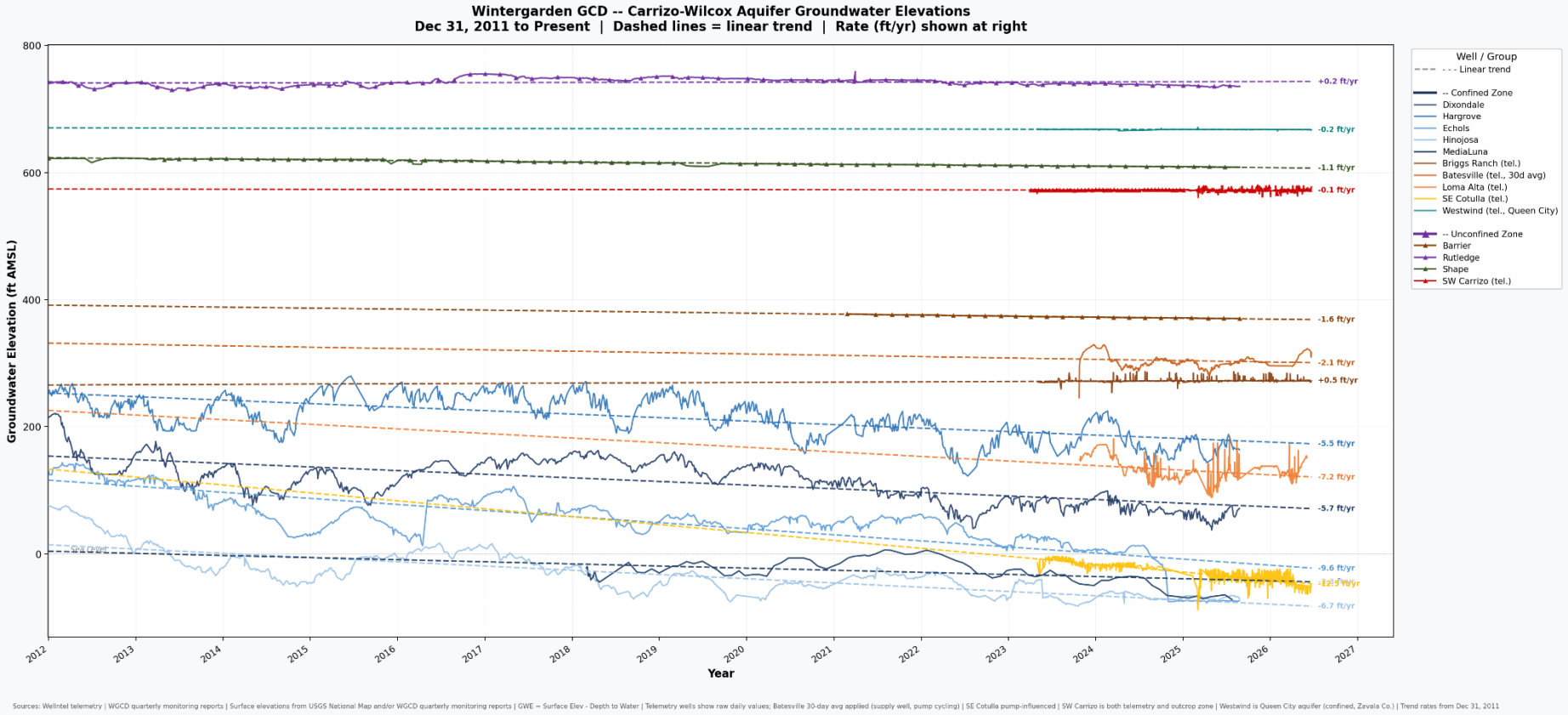


Table 1. Secondary DFC Compliance Calculations

Table 1. Secondary DFC Compliance Tracking —Confined Zone Wells									
Baseline: December 31, 2011 | Trend calculated from Dec 31, 2011 to June 24, 2026 | GMA-13 Secondary DFC: 49 ft (±5 ft) average drawdown by end of 2080 (0.721 ft/yr)									
Well Name	**County**	**Well Type**	**Aquifer**	**Surface Elev. (ft AMSL)**	**GWE Dec 31, 2011 (ft AMSL)**	**Est. GWE June, 2026 (ft AMSL)**	**Trend Rate (ft/yr) Dec 2011–Jun 2026**	**GMA-13 DFC Status (44–54 ft drawdown by 2080)**	**Current Drawdown Since Dec 2011 (14.5 yrs, ft)**
Dimmit County									
Dixondale	Dimmit	Index	Carrizo	549	213.7	71.4	-5.73	**EXCEEDS**	142.3
Briggs Ranch	Dimmit	Telemetry	Carrizo	482		271.7	+0.51	**UNDER**	-6.2
Echols	Dimmit	Index	Carrizo	630	363.1	154.6	-9.49	**EXCEEDS**	208.5
La Salle County									
Hinojosa	La Salle	Index	Carrizo	465	76.0	-70.7	-6.78	**EXCEEDS**	146.7
SE Cotulla	La Salle	Telemetry	Carrizo	356		-53.6	-12.46	**EXCEEDS**	186.8
Media Luna	La Salle	Other	Carrizo	540		-72.1	-3.62	**EXCEEDS**	78.0
Zavala County									
Hargrove	Zavala	Index	Carrizo	624	254.3	254.3	-5.74	**EXCEEDS**	90.8
Westwind	Zavala	Telemetry	Queen City	782	670.2	667	−0.20	**UNDER**	3.2
Loma Alta	Zavala	Telemetry	Carrizo	561		151.6	-7.23	**EXCEEDS**	73.9
Batesville	Zavala	Telemetry (supply)	Carrizo	709		321.6	-2.28	**EXCEEDS**	12.1
Summary Statistics — Non-Telemetry Confined Active Wells (n=5): Dixondale, Hargrove, Echols, Hinojosa, MediaLuna									
Average (mean)							**-6.272**	**EXCEEDS**	**133.3**
Median							**-5.740**	**EXCEEDS**	**142.3**
GMA-13 DFC Target							**-0.710**		**44-54**

Telemetry wells: data begins 2023 (except SE Cotulla). GWE Dec 2011 extrapolated from linear regression fit to available data.

Telemetry wells excluded from summary statistics — inactive well.

Current Drawdown = GWE Dec 2011 minus current GWE (June 2026). Negative = water level has risen.

GMA-13 Secondary DFC: Average drawdown of 49 ft (±5 ft) across confined monitoring wells, end of 2011 through end of 2080 (69 years), equivalent to -0.71 ft/yr.

Table 2. Primary DFC Compliance Calculations

Table 2. Primary DFC Compliance Tracking — Outcrop Zone Wells

Baseline: December 31, 2012 | GMA-13 Primary DFC: 75% of December 31, 2012 saturated thickness retained through December 31, 2080 | Saturated Thickness = GWE − Carrizo Bottom Elevation

Well Name	County	Well Type	Bottom Elev. (ft AMSL)	Layer	GWE Dec 31, 2012 (ft AMSL)	Sat. Thickness Dec 2012 (ft)	Current GWE (Jun 2026, ft AMSL)	Current Sat. Thickness (ft)	% Sat. Thickness Retained	GMA-13 DFC Status (≥75% of 2012)
Barrier	Dimmit	Historical	134.2	7.0	389.7	255.5	368.4	234.2	91.7%	**MEETS**
Rutledge	Zavala	Historical	550.5	7.0	742.0	191.5	741.7	191.2	99.8%	**MEETS**
Shape	Dimmit	Other	69.97	8	622.3	552.3	608.4	538.4	97.5%	**MEETS**
SW Carrizo	Dimmit	Telemetry	78.0	7.0	573.7	495.7	572.0	494.0	99.6%	**MEETS**
DFC Threshold: ≥75% of December 31, 2012 saturated thickness must be retained through December 31, 2080										

Saturated Thickness = Groundwater Elevation (GWE) − Aquifer Bottom Elevation (Carrizo BOT).

GWE = Surface Elevation − Depth to Water (measured in field).

Aquifer elevations from GMA-13 MODFLOW DISU model, Layer 7 and 8.

Current GWE = mean of most recent 12 available readings (2025–2026).

Projected % retained by 2080 based on linear trend from Dec 2012 to Jun 2026, extended to Dec 31, 2080.

Barrier and SW Carrizo Dec 2012 GWE values are extrapolated from regression — direct observations not available at that date.

Sources: WGCD quarterly monitoring reports; WellIntel telemetry; GMA-13 MODFLOW DISU model.