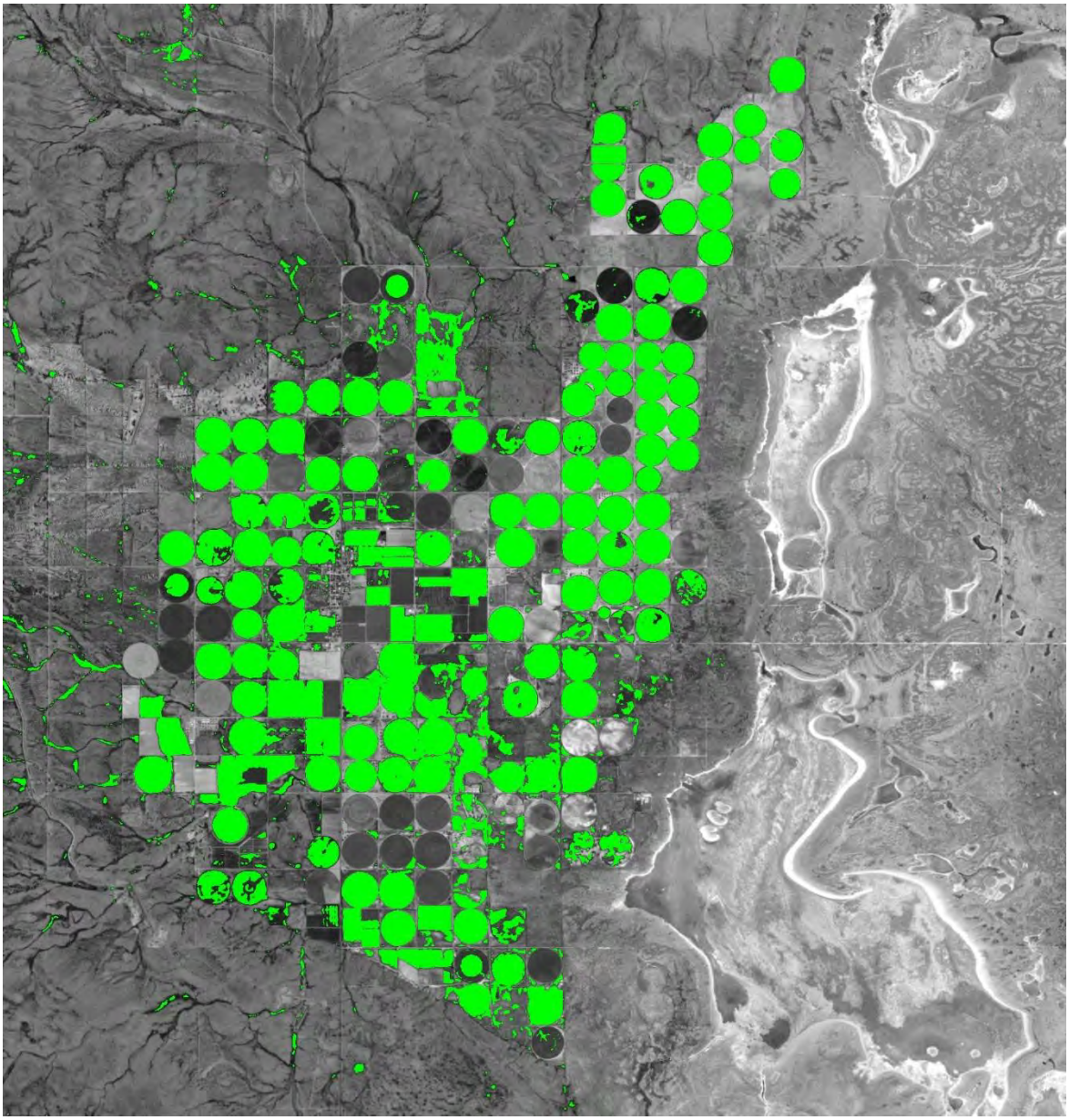
Hudspeth County Underground Water Conservation District No. 1 Groundwater Management Plan



February 14, 2024

Hudspeth County Underground Water Conservation District No. 1

This Management Plan was prepared in accordance with the requirements of Chapter 36 of the Texas Water Code and Title 31, Chapter 356, of the Texas Administrative Code and was made available for public comment prior to adoption by the Board of Directors of the Hudspeth County Underground Water Conservation District No. 1 (the District). An electronic copy of this plan is available for download at hcuwcd1.org and a paper hard copy of this plan is available at the District's office in Dell City, Texas. The sections of this plan are organized in accordance with the Texas Water Development Board's (TWDB) "Groundwater Conservation District Management Plan Checklist."

1. Estimate of Amount of Modeled Available Groundwater - Checklist #1

The 2021 TWDB Report Titled "GAM Run 21-010 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 4" is included in Appendix G, along with TWDB reports GAM Run 23-014. The MAG value of 101,400 acre-feet per year was estimated based on the Desired Future Condition of zero drawdown for the period 2010 through 2060, as approved by GMA4.

2. Amount of Groundwater Being Used from 2018 through 2022 - Checklist #2

Irrigation water use makes up over 99% of the water use in Hudspeth County and in the District. The District requires by rule that all groundwater pumped under validation or operating permits must be metered. Validation permits are basically those that recognize—"validate"—existing and historical use.

The District has issued approximately 78 validation permits identifying over 260 irrigation wells from which groundwater can be pumped. Approximately 120 irrigation wells identified in the validation permits are not equipped with a pump and, thus, are not required to have flow meters. Of the remaining 140 irrigation wells that are equipped with a pump, the District has received meter reading reports for 138 wells.

Domestic, livestock, and municipal use is estimated to be less than 500 acre-feet a year and relatively constant from 2018 through 2022.

Table 2-1 on the next page shows the estimated annual amount of groundwater pumping for the Dell City area based on using a combination of estimates from crop water use estimates and crop acreage from LANDSAT 8 images and meter reading records. In 2023, the District made a sustained effort to make sure all wells were metered and the

meters were working properly. The estimate of unmetered water was 20% in 2020 and 2021, 10% in 2022, and less than 5% in 2023.

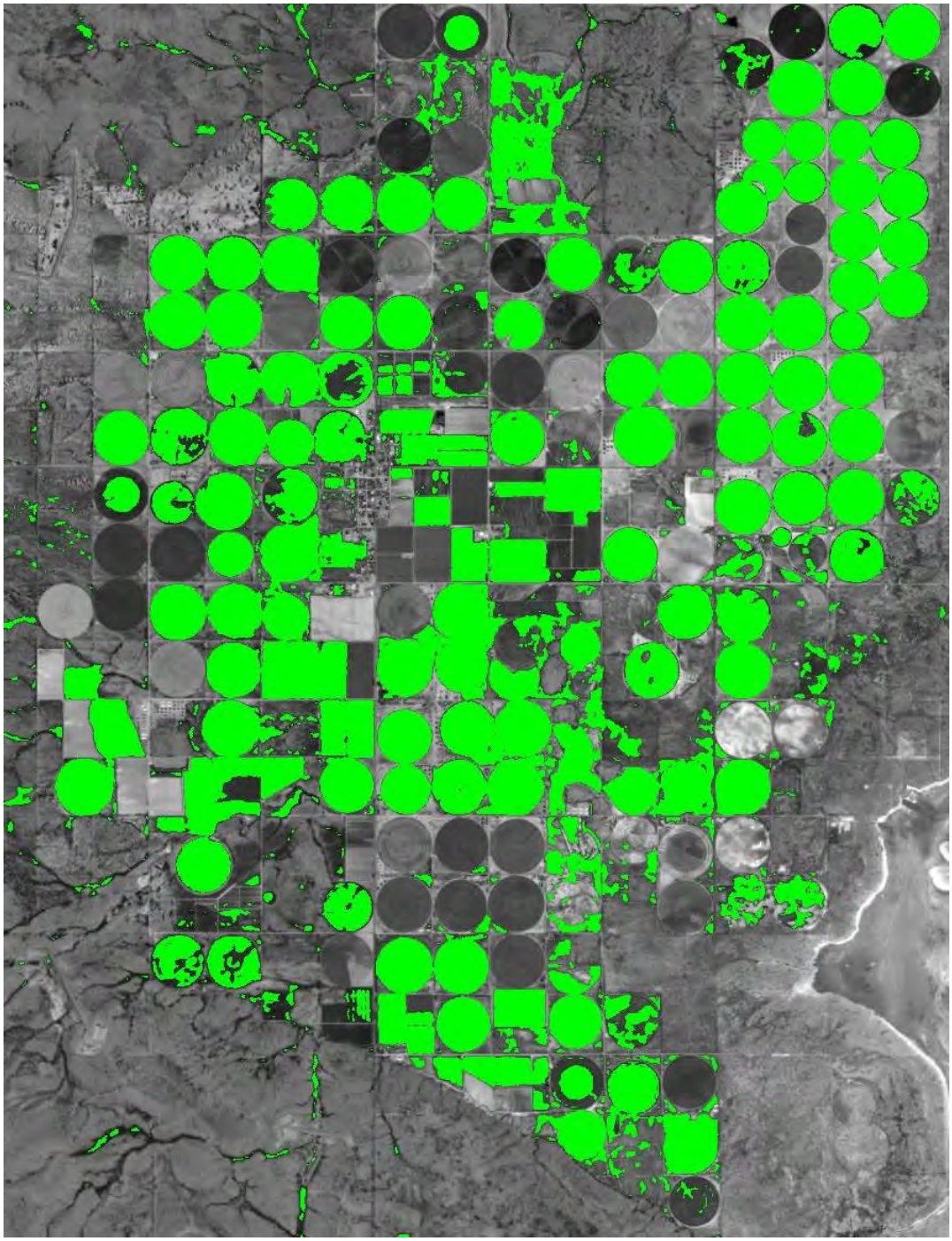


Figure 2-1: Cultivated Acreage in Dell City, Texas, Area in August 2021 from a Landsat 8 Image (Actively growing area shown in green, circular areas are center pivot irrigation systems with approximate diameters of ½ mile)

Table 2-1 – 5 year Record of Water Use in HCUWCD

HCUWCD Groundwater Pumped Estimates (ac-ft/yr)				
Year	By Crop	Metered	UnMetered	Total
2018	77,488	72,911	3,646	76,557
2019	86,242	NA	NA	86,242
2020	91,035	74,795	14,959	89,754
2021	94,392	76,984	15,397	92,381
2022	NA	85,439	8,544	93,983

Appendix E contains the "Estimated Historical Groundwater Uses" provided by the TWDB. The TWDB estimates of Historical Groundwater Use (acre-feet per year) significantly under-estimate the actual historical pumping in the District.

3. Amount of Recharge from Precipitation - Checklist #3

TWDB GAM Run 23-014, attached in Appendix G, estimated the recharge from precipitation over the District is 256 acre-feet per year. The primary recharge zone for the Bone Spring – Victorio Peak Aquifer is outside and north of the District in the Sacramento Mountains drainage area.

4. Estimate of Annual Volume of Water that Discharges from Aquifer - Checklist #4

Historically, water from the Bone Spring -Victorio Peak Aquifer discharged to the alkali lake in the Crow Flat portions of the Salt Basin. The exact date that such discharge stopped is not known but was assumed to have occurred before 1970. Currently, there is no known spring flow from the aquifer (see TWDB GAM Run 23-014 in Appendix G).

5. Estimate of Annual Volumes of Flow – Checklist #5

There is only one aquifer in the district, and it is in a closed basin. Table 5-1 below was prepared by the Texas Water Development Board in the document GAM Run 23-014. The entire document is attached in Appendix G.

6. Projected Surface Water Supply – Checklist #6

Table 6-1 shows the "Projected Surface Water" provided by the TWDB from the 2022 State Water Plan. Table 6-1 shows 142 acre-feet of surface water being available from the Rio Grande in the District during the drought of record. This is incorrect. No water from the Rio Grande is available to water users within the District. There are four

recharge and flood control dams located within the District that do capture storm runoff, but during the drought-of-record the estimated amount of runoff is zero.

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

HUDSPETH COUNTY *19.65% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
E	Irrigation, Hudspeth	Rio Grande	Rio Grande Run-of-River	142	142	142	142	142	142
	Sum of Projected Surface Water Supplies (acre-feet)			142	142	142	142	142	142

Table 5-1: TWDB GAM Run 23-014 Recharge, Inflows and Outflows (acre-feet/year)

7. Projected Total Demand for Water – Checklist #7

Table 7-1 shows the "Projected Water Demand" provided by the TWDB. The projected Total Demand for the District in 2020 for the District is 23,211 acre-feet. This number was calculated by multiplying 0.1965 x 118,122 acre-feet/year (19.65% of Hudspeth County total demand). The area within the District is 19.65 % of the total area of Hudspeth County. Since the District does not cover all of Hudspeth County, county-wide data multiplied by a percentage of area is not representative data for the District.

Table: 7 -1
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.

HUDSPETH COUNTY *19.65% (multiplier)* All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
E	County-Other, Hudspeth	Rio Grande	43	45	45	45	45	45
E	Esperanza Water Service	Rio Grande	142	152	153	154	155	156
E	Hudspeth County WCID 1	Rio Grande	142	151	152	153	154	155
E	Irrigation, Hudspeth	Rio Grande	22,704	22,704	22,704	22,704	22,704	22,704
E	Livestock, Hudspeth	Rio Grande	86	86	86	86	86	86
E	Mining, Hudspeth	Rio Grande	94	89	92	95	97	99
	Sum of Projected Water Demands (acre-feet)		23,211	23,227	23,232	23,237	23,241	23,245

Hudspeth County contains three primary areas of irrigated agriculture: 1) the Hudspeth County Conservation and Reclamation District No. 1 near Ft. Hancock, Texas (approximately 18,000 acres of irrigated land); 2) the Hudspeth County Underground Water Conservation District No. 1 (approximately 34,000 acres of permitted historical irrigated land); and the Salt Flat – Diablo Farms area (approximately 5,000 acres of irrigated land). The approximate amount of irrigated land in Hudspeth County is 57,000 acres, of which it is typical to apply between 3 to 4 feet of water per year to produce an agricultural crop. This results in a Hudspeth County water demand of 171,000 to 228,000 acre-foot/year of which irrigated land in the District is 59.6% (34,000 / 57,000) or between 101,916 and 135,888.

8. Water Supply Needs – Checklist #8

Table 8 -1 shows the "Water Supply Needs" provided by the TWDB. The Water Supply needs for Hudspeth County in 2020 was 196 acre-feet for mining.

Table 8-1

Projected Water Supply Needs

TWDB 2022 State Water Plan Data

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

HUDSPETH COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
E	County-Other, Hudspeth	Rio Grande	139	129	129	129	128	126
E	Esperanza Water Service	Rio Grande	342	332	331	330	329	328
E	Hudspeth County WCID 1	Rio Grande	390	381	380	379	378	377
E	Irrigation, Hudspeth	Rio Grande	10,412	10,412	10,412	10,412	10,412	10,412
E	Livestock, Hudspeth	Rio Grande	23	23	23	23	23	23
E	Mining, Hudspeth	Rio Grande	-196	-168	-185	-200	-209	-219
	Sum of Projected Water Supply Needs (acre-feet)		-196	-168	-185	-200	-209	-219

9. Water Management Strategies

Table 9-1 shows the "Water Management Strategies" provided by the TWDB from the 2022 State Water Plan. There are no strategies listed for the District.

Table 9-1

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

HUDSPETH COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
County-Other, Hudspeth, Rio Grande (E)							
Hudspeth County Other (Dell City) - Brackish Groundwater Desalination Facility	Bone Spring-Victorio Peak Aquifer [Hudspeth]	0	111	111	111	111	111
Hudspeth County Other - Hudspeth Co. WCID 1 - Groundwater Well NE of Van Horn	West Texas Bolsons Aquifer [Culberson]	39	39	39	39	39	0
Hudspeth County Other - Hudspeth Co. WCID 1 - Groundwater Well West of Van Horn	Other Aquifer [Hudspeth]	39	39	39	39	39	39
Hudspeth County Other - Hudspeth Co. WCID 1 - Local Groundwater Well	Other Aquifer [Hudspeth]	16	16	16	16	16	16
Hudspeth County Other - Hudspeth Co. WCID 1 - Public Conservation Education	DEMAND REDUCTION [Hudspeth]	1	2	2	2	2	2
Hudspeth County Other - Hudspeth Co. WCID 1 - Replace Water Supply Line from Van Horn	West Texas Bolsons Aquifer [Culberson]	0	39	39	39	28	0
		95	246	246	246	235	168
Mining, Hudspeth, Rio Grande (E)							
Hudspeth County Mining - Additional Groundwater Well	West Texas Bolsons Aquifer [Hudspeth]	219	219	219	219	219	219
		219	219	219	219	219	219
Sum of Projected Water Management Strategies (acre-feet)		314	465	465	465	454	387

The District promotes the following water conservation methods:

- Irrigation Scheduling
- Reuse of Irrigation Tailwater
- Low Pressure Center Pivot Systems
- Drip Irrigation

Most irrigated land in the District is planted with alfalfa for hay. Hay production requires repetitive field operations of irrigation, cutting or windrowing, raking, and bailing. The harvest operations depend on the alfalfa leaf area being relatively dry, and the moisture of the cut hay must be optimal for bailing (neither too dry nor too wet). This sequence of

irrigation, cutting, raking, and bailing is typically repeated 5 to 8 times per year. Because the scheduling of these harvest operations takes priority over crop water requirements, irrigation scheduling is seldom used in alfalfa hay production and, thus, is not a useful conservation strategy for the District. Similarly, because alfalfa is a multi-year crop (3 to 6 years) between replanting, conservation tillage is of limited value for alfalfa production.

The majority of the irrigated land within the District is irrigated using low-pressure center pivots. Currently, only high-value crops in the District, such as grapes, are irrigated using drip irrigation. Several farms in the far southwest area of New Mexico and the eastern area of Arizona are using subsurface drip irrigation for alfalfa production. The irrigation water quality at these locations is typically much higher (less salt) than the quality of the groundwater in the District. Nonetheless, some potential exists within the District for increasing the amount of drip irrigation.

10. Management of Groundwater Supplies – Checklist #10

The District will manage the production of groundwater from the Bone Spring-Victorio Peak aquifer within the District in a sustainable manner. The District will identify and engage in such practices that, if implemented, would result in more efficient use of groundwater.

The District shall prepare an annual report summarizing District activities to be approved by the Board of Directors during the first quarter of each year. A newsletter will be mailed to all validation and operational permit holders.

11. Actions, procedures, performance, and avoidance that are or may be necessary to effect the plan, including specifications and proposed rules – Checklist #11

The District has specified in the District's rules, including the District's groundwater production permitting process, the actions, procedures, performance, avoidance, and specifications necessary to effect this Management Plan. The District has an active program to meter all non-exempt groundwater produced in the District and enforces permit limitations and waste of water, including assessing penalties for violating the District's rules. The following sections of the rules are specifically incorporated into this plan for the purposes of specifying in "as much detail as possible in the plan" as stated as in TWDB checklist item #11:

Chapter 3. Regulation Of Spacing And Production

Chapter 4. District Groundwater Management Plan

Chapter 5. Flow Measurement

Chapter 6. Permits, Records, Reports, And Logs

Chapter 7. Exemptions, Exceptions, And Limitations To Permitting

Chapter 9. Waste And Beneficial Use

Chapter 10. Procedures Before The District

Chapter 11. Investigations And Enforcement

Chapter 13. Minimum Standards Of Well Completion

Operations of the District, all agreements entered into by the District, and any additional planning activities in which the District participates will be consistent with this plan and with the District's rules. A copy of the District's rules can be downloaded from www.hcuwcd1.org.

12. Evidence Plan was Adopted after Notice and Hearing – Checklist #12

A certified copy of the District Resolution adopting this Management Plan is attached as Appendix A. A hearing notice was published in the *Hudspeth County Herald*, a newspaper of general circulation in Hudspeth County, Texas, 13th day of February 2024, and a copy of the published notice is attached as Appendix B. Also enclosed, as Appendices C and D, respectively, are copies of the posted agenda for the hearing and the minutes of the hearing.

13. Coordination with Regional Surface Water Management Entities – Checklist #13

There are no surface water political subdivisions or river authorities within the boundaries of the District, and no surface water is available to any portion of the District.

The District's General Manager is a Far West Texas Regional Water Planning Group member and coordinates with the group on groundwater issues in Hudspeth County. A copy of the transmittal letter is included in Appendix F of this plan, showing that a copy of the plan, following notice and hearing, was hand-delivered to the Chair of the Far West Regional Water Planning Group requesting the group's comments.

14. Site Specific Information Checklist # 14

Section 19 lists references for technical publications describing the characteristics of the groundwater resources within the District.

15. Management Goals, Objectives, and Performance Standards Checklist #15-42

15.1. Addressing Efficient Use of Groundwater

Management Objective: Each year the District will provide information to the general public about the status of the groundwater in the District.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports each year to the Board of Directors regarding the amount of groundwater being withdrawn from the aquifer.

Performance Standard: The District's annual newsletter that will be mailed to each of the existing validation and operating permit holders will include information on the status of groundwater in the District.

15.2. Addressing Controlling and Preventing Waste of Groundwater

Management Objective and Goal: The District will inform District water users about the efficient use of water and methods to prevent waste.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports each year to the Board of Directors regarding the efficient use of water and methods to prevent waste.

Performance Standard: The District's annual newsletter that will be mailed to all validation and operating permit holders will include an article on irrigation water management.

15.3. Addressing Controlling and Preventing Subsidence

This management goal does not apply to the District, and the District has not established any Management Objectives or Performance Standards for this conservation goal. No observed subsidence exists in the District, and this goal is not applicable to the District. As reported in Ashworth 2001:

> *The Bone Spring Limestone is predominantly a black to dark-gray, cherty limestone with thin interbedded black or brown layers of siliceous shale. The Bone*

Spring grades upward into the Victorio Peak Limestone, a light-gray, thick-bedded, mainly calcitic but slightly dolomitic limestone. These Permian age rocks are the principal water bearing units of the aquifer. Flow through the aquifer is primarily along dissolution features in the rock.

The District has reviewed the TWDB subsidence risk report "*Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping*" (http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp), and on page 4-99 the authors state: "*Results of the assessment suggest that the Bone Spring–Victorio Peak Aquifer has a low risk for future subsidence due to pumping."* Figure 4.64 shows a single location with medium subsidence risk located in the salt flats area of the ephemeral Linda Lake (a salt playa). No pumping occurs from wells in the salt playa because of poor water quality and poor soils.

15.4. Addressing Conjunctive Surface Water Management Issues

There are no known conjunctive surface water management issues within the District, and this management item is not applicable to the District's Management Plan.

15.5. Addressing Natural Resource Issues

Management Objective and Goal: The amount of groundwater withdrawals permitted by the District shall be tied to the long-term sustainable amount of recharge to the portion of the aquifer within the District and the groundwater elevation measured in the District's monitoring well(s) in accordance with the District's rules, in such a way as to protect the historical and existing uses of groundwater withdrawn from the portion of the Bone Spring-Victorio Peak aquifer located within the District.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports each year to the Board of Directors regarding the amount of groundwater being withdrawn from the aquifer.

Performance Standard: The District shall report annually to the Board on the amount of groundwater being withdrawn through non-exempt wells located within the District, measured through the District's flow metering program, for the quantification of existing and historical use of groundwater within the District's boundaries, and the issuing of validation and operational permits for all nonexempt wells in operation.

Management Objective and Goal: The District may inspect suspended and abandoned wells to ensure proper closing of wells in accordance with the District rules. Notices will

be sent and fines may be assessed against well owners whose wells do not adhere to District rules.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports each year to the Board of Directors regarding rule violations.

Performance Standard: The following will be the expected key metrics used to measure progress of management objectives:

The number of notices sent out and possible fines assessed to well owners or operators concerning violations of District rules;

The number of wells plugged each year;

15.6. Addressing Drought Conditions

Management Objective and Goal: The annual amount of groundwater permitted by the District for withdrawal from the portion of the Bone Spring-Victorio Peak aquifer located within the District may be curtailed during periods of extreme drought in the recharge zone of the aquifer or because of other conditions that cause significant declines in groundwater-surface elevations. Such curtailment may be triggered by the District's Board based on the groundwater elevation measured in the District's monitoring well(s).

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports regarding groundwater elevations to the Board of Directors.

Performance Standard: The District's annual report will include a report on the District's monitoring well groundwater elevation at least ten measurements per year and a report on whether the permitted withdrawals were curtailed at any time during the year because of drought conditions as reported at https://www.waterdatafortexas.org/drought.

15.7. Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, and Brush Control

Management Objective and Goal: The District shall promote conservation through the efficient application of irrigation water to field crops.

Methodology for Tracking Progress: The General Manager shall give one or more oral reports to the Board of Directors each year in regard to any new irrigation system being installed in the District.

Performance Standard: The District shall assist in organizing the field demonstration of irrigation water conservation technology during one day every other year.

Management Objective and Goal: Recharge Enhancement. The majority of the recharge to the Bone-Spring/ Victorio Peak aquifer occurs from runoff from the Sacramento Mountains watershed and aquifer outcrop located entirely within New Mexico. Management of the recharge enhancement is not practicable by the District.

Management Objective and Goal: The District shall promote rainwater harvesting, precipitation enhancement, and brush control.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports to the Board of Directors regarding groundwater, any new, if any, rainwater harvesting, precipitation enhancement, and brush control projects in the District.

Performance Standard: The District shall include articles on rainwater harvesting, precipitation enhancement, and brush control in its annual newsletter mailed to all of its validation and operating permit holders.

15.8. Addressing Modeled Available Groundwater and Desired Future Conditions

Management Objective: The District shall adopt a Modeled Available Groundwater and Desired Future Conditions value in accordance with the requirements of Chapter 36 of the Texas Water Code and Title 31, Chapter 356, of the Texas Administrative Code.

Methodology for Tracking Progress: The District General Manager shall provide one or more oral reports to the Board of Directors regarding GMA 4 activities.

Performance Standard: The District has participated in the GMA 4 meetings with at least one meeting per year and will continue working with GMA 4 and the Texas Water Development Board to determine the amount of Modeled Available Groundwater and the Desired Future Conditions within the District.

16. Addressing Desired Future Conditions – Checklist #43-46

The GMA 4 Resolution on 8/16/2021 set a Desired Future Condition for the Bone Spring – Victorio Peak Aquifer of 0 feet of change in the average groundwater elevation at the end of the 50-year planning period from 2010 to 2060. The following objectives and performance standards will be used to address the District's Desired Future Conditions.

Management Objective and Goal: The District will continuously measure the water levels in at least one monitoring well, manually measure water levels each year in at least five monitoring wells within the District, and determine the average groundwater levels every two years. The District will compare the two-year water level averages to the corresponding two-year increment of its DFCs in order to track its progress in achieving the DFCs.

Methodology for Tracking Progress: . The General Manager shall give a written report to the Board of Directors every other year in regard to the two-year water level averages.

Performance Standard: The District's Annual Report will include the water level measurements taken each year for the purpose of measuring water levels to assess the District's progress towards achieving its DFCs. The District will discuss its comparison of water level averages to the corresponding two-year increment of its DFCs to track its progress in achieving its DFCs.

Management Objective and Goal: The District will review and calculate the total amount of groundwater pumped within the District and assess whether the District is on target to meet the DFC estimates submitted to the TWDB.

Methodology for Tracking Progress: The District shall document all flow measurements in its flow measurement database.

Performance Standard: The District's Annual Report will include a discussion of the measured groundwater levels and the amount of water pumped each year within the District and will evaluate the District's progress in achieving the DFCs of the groundwater resources within the boundaries of the District and whether the District is on track to maintain the DFC estimates over the fifty-year planning period.

17. References

Ashworth, John, (1995), Ground-water resources of the Bone Spring-Victorio Peak Aquifer in the Dell Valley Area, Texas, Texas Water Development Board Report No. 344, Austin, Texas, 43 pg.

Mace, Robert, et al (2001), Aquifers of West Texas, Texas Water Development Board Report No. 356, Austin, Texas, pg.135-152.

Mayer, J.R., (1995), The role of fractures in regional groundwater flow: Field evidence and model results from the basin-and-range of Texas and New Mexico, M.S. Thesis from University of Texas, Austin.

Logan, H.H., (1984), A groundwater recharge project associated with a flood protection plan in Hudspeth County, Texas, Master Thesis – Texas Christian University, 110 pg. (as cited in Ashworth, 1995).

Furnans, Jordan, et al (2017), Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping, TWDB Contract Number 1648302062

Appendices

Appendix A – Copy of Resolution Adopting Management Plan

Appendix B – Notice of Hearing

Appendix C – Agenda for February 13, 2024 Board Meeting and Hearing on Groundwater Management Plan

Appendix D - Minutes from February 13, 2024 Hearing

Appendix E - Estimated Historical Groundwater Use

Appendix F – Copy for Transmittal Letter to Chair of Far West Texas Water Planning Group

Appendix G – TWDB GAM Run 21-010 and 23-014

Appendix A – Copy of Resolution Adopting Management Plan

Hudspeth County Underground Water Conservation District #1

P.O. Box 212
107 S. Dodson
Dell City TX 79837
Phone: (915) 964-2932
Fax: (915) 964-2973

hcuwed1@dellcity.com

Resolution of the Board of Directors

Regular Board Meeting of February 13, 2024

Agenda Item 5: Discuss and take action on approval of Management Plan
Having a quorum present at the meeting, the Board of Director unanimously approved the District's 2003 Groundwater Management Plan dated February 13, 2024

Ben Snow

Board, President

Appendix B – Notice of Hearing

Hudspeth County Herald

Make an informed decision, Meet your Candidates...
All Hudspeth County Registered Voters are invited
HUDSPETH COUNTY CANDIDATE MEET & GREET

CANDIDATE FORUM

-DATE - -TIME - -LOCATION-

-SIERRA BLANCA -
FEBRUARY 3rd AT 1PM
SB COUNTY BARN

-FT HANCOCK -
FEBRUARY 10th AT 1PM
FH COMMUNITY CENTER

-DESERT HAVEN -
FEBRUARY 17th AT 1PM
DHV FIRE DEPARTMENT

-DELL CITY -
FEBRUARY 24th AT 1PM
DC COMMUNITY CENTER

Primary Election March 5, 2024
(Early voting starts February 20)

Hudspeth County Underground Water Conservation District #1
P.O. Box 212
107 S. Dodson
Dell City TX 79837
(915) 964-2932
hcuwcd1@hcuwcd1.org

PUBLIC NOTICE OF GROUNDWATER MANAGEMENT PLAN FOR ADOPTION BY THE Hudspeth County Underground Water Conservation District No. 1

Hudspeth County Underground Water Conservation District No. 1 (the District) is proposing to amend the District's groundwater management plan. Copies of the proposed groundwater management plan are available for review at the District's Office located at 107 S. Dodson Street in Dell City, Texas Monday through Wednesday from 8:00 AM to 3:00 PM. To obtain a copy of the management plan or additional information please contact the District office by phone at 915-964-2932, by US MAIL at P.O. Box 212, Dell City, Texas 79837 or by e-mail at hcuwcd1@hcuwcd1.org .
As an aid to the District's Board, any person wishing to comment on the proposed groundwater management plan should give written notice of such comments to the District by February 12, 2024. The District will conduct a hearing in and consider adoption of the proposed groundwater management plan at the District's Board meeting that is scheduled for February 13, 2024 at 1:00 PM at the District Office located at 107 S. Dodson, Dell City, Texas. Verbal comments regarding the proposed groundwater management plan will be accepted by the Board during the hearing.

AVISO PÚBLICO DE AGUAS SUBTERRÁNEAS PLAN DE GESTIÓN PARA SU ADOPCIÓN POR LA Distrito de Conservación de Aguas Subterráneas No. 1 del Condado de Hudspeth

El Distrito de Conservación de Aguas Subterráneas No. 1 del Condado de Hudspeth (el Distrito) propone enmendar el plan de gestión de aguas subterráneas del Distrito. Las copias del plan de manejo de aguas subterráneas propuesto están disponibles para su revisión en la Oficina del Distrito ubicada en 107 S. Dodson Street en Dell City, Texas, de lunes a miércoles de 8:00 a.m. a 3:00 p.m. Para obtener una copia de la plan de manejo o información adicional, comuníquese con la oficina del Distrito por teléfono al 915-964-2932, por correo postal a P.O. Box 212, Dell City, Texas 79837 o por correo electrónico al hcuwcd1@hcuwcd1.org. Como ayuda para la Junta del Distrito, cualquier persona que desee comentar sobre el plan de manejo de aguas subterráneas propuesto debe notificar por escrito dichos comentarios al Distrito antes del 12 de febrero de 2024. El Distrito llevará a cabo una audiencia y considerará la adopción del plan de manejo de aguas subterráneas propuesto en el Distrito Reunión de la Junta Directiva que está programada para el 13 de febrero de 2024 a la 1:00 p. m. en la Oficina del Distrito ubicada en 107 S. Dodson, Dell City, Texas. Los comentarios verbales sobre el plan de manejo de aguas subterráneas propuesto serán aceptados por la Junta durante la audiencia.

General Manager, Randy Barker

THE CITY of DELL CITY

P.O. BOX 125, DELL CITY, TEXAS 79837 - PHONE (915) 964-2344 - FAX (915) 964-2394

JOB OPENING

FOR PUBLIC WORKS

Beginning on January 29, 2024

We are in need of a part-time employee to assist in Public Works for the City of Dell City.

Working Conditions
Physically demanding job that requires working in outdoor conditions during working hours of the day. Employee will handle, operate, and lift heavy equipment of fifty pounds or more. Will also require working with water and wastewater utilities.

Qualifications

- High School Diploma or GED
- Possession of a valid driver's license
- At least one year of experience working in Water Operations
- Background check will be required
- Resume required
- Bilingual in English and Spanish preferred
- Able to work during normal working hours, Monday through Friday as well as some weekends

Essential Tasks
Employee will need to perform the following tasks and more:

- Operate equipment such as, backhoe, tractor, truck, etc.
- Repair and Install equipment, water lines, water meters, wastewater lines
- Heavy lifting, frequent bending or kneeling
- Drive to far locations
- Maintain facility and equipment
- Perform other duties as requested and instructed by the Supervisor

Benefits Include

- Pay is yet to be determined upon experience
- Health Insurance –Medical, Dental, Vision
- Retirement Plan

Resumes may be submitted at the City Hall Office, 102 S. Dodson St., Dell City, Texas 79837, by mail at our P.O. Box 125, Dell City, Texas 79837 or by email at dellcity@dellcity.com

Hudspeth County Underground Water Conservation District #1
P.O. Box 212
107 S. Dodson
Dell City TX 79837
(915) 964-2932
hcuwcd1@hcuwcd1.org

PUBLIC NOTICE OF GROUNDWATER MANAGEMENT PLAN FOR ADOPTION BY THE Hudspeth County Underground Water Conservation District No. 1

Hudspeth County Underground Water Conservation District No. 1 (the District) is proposing to amend the District's groundwater management plan. Copies of the proposed groundwater management plan are available for review at the District's Office located at 107 S. Dodson Street in Dell City, Texas Monday through Wednesday from 8:00 AM to 3:00 PM. To obtain a copy of the management plan or additional information please contact the District office by phone at 915-964-2932, by US MAIL at P.O. Box 212, Dell City, Texas 79837 or by e-mail at hcuwcd1@hcuwcd1.org
As an aid to the District's Board, any person wishing to comment on the proposed groundwater management plan should give written notice of such comments to the District by February 12, 2024. The District will conduct a hearing in and consider adoption of the proposed groundwater management plan at the District's Board meeting that is scheduled for February 13, 2024 at 1:00 PM at the District Office located at 107 S. Dodson, Dell City, Texas. Verbal comments regarding the proposed groundwater management plan will be accepted by the Board during the hearing.

AVISO PÚBLICO DE AGUAS SUBTERRÁNEAS PLAN DE GESTIÓN PARA SU ADOPCIÓN POR LA Distrito de Conservación de Aguas Subterráneas No. 1 del Condado de Hudspeth

El Distrito de Conservación de Aguas Subterráneas No. 1 del Condado de Hudspeth (el Distrito) propone enmendar el plan de gestión de aguas subterráneas del Distrito. Las copias del plan de manejo de aguas subterráneas propuesto están disponibles para su revisión en la Oficina del Distrito ubicada en 107 S. Dodson Street en Dell City, Texas, de lunes a miércoles de 8:00 a.m. a 3:00 p.m. Para obtener una copia de la plan de manejo o información adicional, comuníquese con la oficina del Distrito por teléfono al 915-964-2932, por correo postal a P.O. Box 212, Dell City, Texas 79837 o por correo electrónico al hcuwcd1@hcuwcd1.org. Como ayuda para la Junta del Distrito, cualquier persona que desee comentar sobre el plan de manejo de aguas subterráneas propuesto debe notificar por escrito dichos comentarios al Distrito antes del 12 de febrero de 2024. El Distrito llevará a cabo una audiencia y considerará la adopción del plan de manejo de aguas subterráneas propuesto en el Distrito Reunión de la Junta Directiva que está programada para el 13 de febrero de 2024 a la 1:00 p. m. en la Oficina del Distrito ubicada en 107 S. Dodson, Dell City, Texas. Los comentarios verbales sobre el plan de manejo de aguas subterráneas propuesto serán aceptados por la Junta durante la audiencia.

General Manager, Randy Barker

AFFIDAVIT OF PUBLICATION

STATE OF TEXAS '
COUNTY OF HUDSPETH'

Before me, the undersigned notary public, on this day personally appeared,

SHANNON MARTIN-STEWART , who being by me duly
(name of newspaper representative)

sworn, deposes and says that (s)he is the EDITOR
(title of newspaper representative)

of the HUDSPETH COUNTY HERALD; that said newspaper is regularly published in Hudspeth County, Texas, and is the largest newspaper in circulation in Hudspeth County, Texas;

and that the attached notice was published in said newspaper on the following date(s):

Public Notice February 2nd + 9th 2024

S M Stewart
Newspaper Representative's Signature

Subscribed and sworn to before me this the day of this the 21 day of May 20 24, to certify

which witness my hand and seal of office.

(Seal)

ORALIA SARINANA
My Notary ID # 132938534
Expires February 23, 2025

Notary Public in and for the State of Texas

Oralia Sarinana
Print or Type Name of Notary Public

My commission expires: Feb. 23, 2025

Appendix C – Agenda for February 13, 2024 Board Meeting and Hearing on Groundwater Management Plan

NOTICE OF REGULAR MEETING
OF THE GOVERNING BODY OF THE HUDSPETH COUNTY UNDERGROUND WATER CONSERVATION DISTRICT #1

Notice is hereby given that the Board of Directors of the Hudspeth County Underground Water Conservation District #1 will meet in a Public Hearing and Regular Session at the following location and time:

Location: **HCUWCD #1**
105 Dodson
Dell City, TX 79837

Time: **February 13, 2024 @ 1:00 P.M.**

MEETING AGENDA

At the above time and location, the District's Board of Directors will discuss and may take action on any items on this agenda which it may determine would be appropriate, to-wit:

Call to order and welcome all guests

1. Welcoming of Guests.
2. Convene Public Hearing on Management Plan
3. Recognition of a Quorum
4. Public Comment on Management Plan
5. Discuss and take action on adoption of Management Plan
6. Close Public Hearing
7. Discuss and take action for approval of minutes of the Regular meeting on January 9, 2024.
8. Discuss and take action for approval of bills and financial report.
9. Discuss and take action on administrative completeness of Application by Guitar Holding Company, L.P. and Guitar Water Group, LLC, to Amend Permit No. IDP311-01(3.11 for In-District Use of Groundwater for Irrigation Purposes)
10. Discuss and take action on Application by Guitar Holding Company, L.P., and Guitar Water Group, LLC, to Amend Permit No. IDP311-01 to change to Irrigation and Industrial Use(with Annual Amount of Water Use of 560 AFY Irrigation and 40 AFY Industrial)
11. The District Board may, at any time during the Meeting, close the Meeting and hold an Executive Session for consultation with its attorneys concerning any of the matters to be considered during the Meeting pursuant to Chapter 551 of the Texas Open Meetings Act.
12. Adjourn.

I, the undersigned authority of the District, do hereby certify that the above notice is a true and correct copy of said notice and that such notice was posted on the main entrance of the District's office located at 105 S. Dodson, Dell City, Texas, at least 72 hours prior to the time of said meeting, and that copy of said notice was furnished via facsimile to the Clerk of Hudspeth County, Texas at least 72 hours prior to the time of said meeting.

Date: 8 Feb 2024 Time: 7:17 am

Ben Snow

Ben Snow, President

I, the Clerk of Hudspeth County, Texas do hereby certify that the above notice of meeting is a true and correct copy of said notice and that such notice has been posted on the bulletin board at the Hudspeth County Court House in Sierra Blanca, Texas, at least 72 hours prior to the time of said meeting.

Date: Feb. 8, 2024 Time: 8:20 am

Brenda Sanchez, County Clerk
Hudspeth County, Texas

POSTED 2/8/2024

Appendix D - Minutes from February 13, 2024 Hearing and Board Meeting

HUDSPETH COUNTY UNDERGROUND
WATER CONSERVATION DISTRICT #1
Public Hearing and Regular Meeting –February 13, 2024 @ 1:00 pm
District Office 105 Dodson
Dell City, Texas 79837

Directors Present	**Directors Absent**	**Visitors**
Ben Snow – President	None	Gregg Duggar
Roderick "Rigo" Hinojosa - Vice Pres.		Keith Newbill
James Rascoe-Sec./Tres.		M.J. Alvord
Lindsay Snodgrass-Member		Brian Archuleta
Randy L. Barker-Member		Larry Brewton

Staff Present
Randy L. Barker-General Manager
Della Tavarez-Administrative Assistant
Rachel Harmon-Field Technician
Al Blair – District Engineer
Renea Hicks – District Attorney via Zoom

1. **President Ben Snow convened the Public Hearing on the Draft Management Plan at 1:00 P.M., on, February 13, 2024.**
2. **No Comments were made during the hearing.**
3. **President Ben Snow closed the Public Hearing on the Management Plan at 1:01 P.M. February 13, 2024**

President Ben Snow called the regular meeting to order at 1:01 P.M., on, February 13, 2024.

4. Welcoming of Guests and Open Forum for Public Comment.
Brian Archuleta spoke to the directors concerning the completion of the maintenance on the dams and replacements of the hydraulic valves for the discharge water.

5. Discuss and take action on approval of Management Plan.
Lindsay Snodgrass made a motion to approve the Management Plan. Rigo Hinojosa seconded, and the motion passed.

6. Discuss and take action for approval of the minutes of the regular meeting on January 9, 2024.
James Rascoe made the motion to approve the minutes of the regular meeting on January 9, 2024.
Randy Barker seconded, and the motion passed.

7. Discuss and take action for approval of bills and financial report for February.
Lindsay Snodgrass made the motion to approve the bills and financial report for February. James Rascoe seconded, and the motion passed.

8. Discuss and take action on administrative completeness of Application by Guitar Holding Company, L.P, and Guitar Water Group, LLC, to Amend Permit No. IDP311-01(3.11 for In-District Use of Groundwater for Irrigation Purposes).

Lindsay Snodgrass made a motion to approve the administrative completeness of Application by Guitar Holding Company, L.P., and Guitar Water Group, LLC, to Amend Permit No. IDP311-01(3.11 for In-District Use of Groundwater for Irrigation Purposes. Rigo Hinojosa seconded, motion passed.

9. Discuss and take action on Application by Guitar Holding Company, L.P., and Guitar Water Group, LLC, to Amend Permit No IDP311-01 to change to Irrigation and Industrial Use(with Annual Amount of Water Use of 560 AFY Irrigation and40AFYIndustrial.)
James Rascoe made a motion to table the Application by Guitar Holding Company, L.P., and Guitar Water Group, LLC, to Amend Permit No IDP311-01 to change to Irrigation and Industrial Use (with Annual Amount of Water Use of 560 AFY Irrigation and 40 AFY Industrial. Rigo Hinojosa seconded and the motion tabled.

10. The District Board may, at any time during the Meeting, close the Meeting and hold an Executive Session for consultation with its attorneys concerning any of the matters to be considered during the Meeting pursuant to Chapter 551 of the Texas Open Meetings Act.

11. Adjourn.
Randy Barker made the motion to adjourn at 1:17 PM. Rigo Hinojosa seconded, and the motion passed.

PASSED AND APPROVED THIS 12 *DAY OF* March, *2024*

Attest:

James Rascoe/Secretary/Treasure

Rigo Hinojosa, Vice-President

Appendix E - Estimated Historical Groundwater Use

Note: TWDB Historical Water use for the District was based on the percentage area that the District comprises within Hudspeth County (19.65%), and not the percentage of water use of the District in the county (over 80% during drought). Table 1-1 shows the correct water use.

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

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

HUDSPETH COUNTY *19.65% (multiplier)* All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	151	0	11	0	17,806	51	18,019
	SW	0	0	0	0	1,631	9	1,640
2018	GW	138	0	5	0	15,983	50	16,176
	SW	0	0	0	0	2,174	9	2,183
2017	GW	139	0	4	0	16,372	48	16,563
	SW	0	0	0	0	2,413	8	2,421
2016	GW	127	0	4	0	13,812	66	14,009
	SW	0	0	0	0	1,434	12	1,446
2015	GW	97	0	4	0	16,434	63	16,598
	SW	0	0	0	0	1,547	11	1,558
2014	GW	92	0	4	0	16,316	64	16,476
	SW	0	0	0	0	590	11	601
2013	GW	98	0	10	0	16,106	61	16,275
	SW	0	0	0	0	1,393	11	1,404
2012	GW	94	0	10	0	22,494	69	22,667
	SW	0	0	0	0	2,387	12	2,399
2011	GW	95	0	0	0	20,254	89	20,438
	SW	0	0	0	0	7,860	16	7,876
2010	GW	95	0	45	0	12,366	82	12,588
	SW	0	0	47	0	13,755	14	13,816
2009	GW	92	0	44	0	12,942	90	13,168
	SW	0	0	45	0	15,399	16	15,460
2008	GW	110	0	42	0	18,298	80	18,530
	SW	0	0	44	0	14,735	14	14,793
2007	GW	92	0	0	0	18,863	75	19,030
	SW	0	0	0	0	10,998	13	11,011
2006	GW	96	0	0	0	16,368	76	16,540
	SW	0	0	0	0	4,520	13	4,533
2005	GW	78	0	0	0	28,067	70	28,215
	SW	0	0	0	0	4,192	12	4,204
2004	GW	96	0	0	0	30,203	71	30,370
	SW	0	0	0	0	2,598	4	2,602

Appendix F – Copy for Transmittal Letter to Chair of Far West Texas Water Planning Group

Hudspeth County Underground Water Conservation District #1

P.O. Box 212
107 S. Dodson
Dell City TX 79837
Phone: (915) 964-2932
Fax: (915) 964-2973

hcuwcd1@hcuwcd1.org

May 30, 2024

VIA EMAIL sreinert@epwu.org

To: Scott Reinert – Chairman of Far West Texas Water Planning Group

RE: District Groundwater Management Plan

Please be advised that the Board of Directors of the Hudspeth County Underground Water Conservation District #1 has approved the District's 2023 Management Plan at our regular meeting on February 13, 2024. A copy of the management plan is attached to this email.

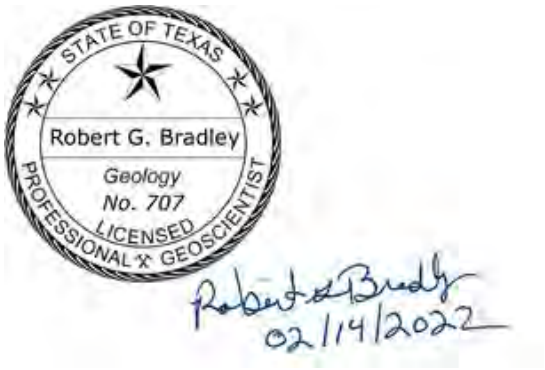
Sincerely,

Randy L. Barker, General Manager

Appendix G – TWDB GAM Run 21-010 and 23-014

GAM RUN 21-010 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 4

Radu Boghici, P.G. and Robert G. Bradley, P.G.
Texas Water Development Board
Groundwater Division
(512) 463-5808
January 21, 2022



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GAM RUN 21-010 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 4

Radu Boghici, P.G. and Robert G. Bradley, P.G.
Texas Water Development Board
Groundwater Division
(512) 463-5808
January 21, 2022

EXECUTIVE SUMMARY:

The modeled available groundwater for the relevant aquifers of Groundwater Management Area 4—the Bone Spring-Victorio Peak, Capitan Reef Complex, Edwards-Trinity (Plateau), Igneous, Marathon, and West Texas Bolsons aquifers—are summarized by decade for use for the groundwater conservation districts (Tables 1, 3, 5, 7, 9, and 11) and in the regional water planning process (Tables 2, 4, 6, 8, 10, and 12)). The modeled available groundwater estimates are:

- 101,400 acre-feet per year in the Bone Spring-Victorio Peak Aquifer,
- 8,163 acre-feet per year in the Capitan Reef Complex Aquifer,
- 1,394 acre-feet per year in the Edwards-Trinity (Plateau) Aquifer,
- 11,331 to 11,336 acre-feet per year in the Igneous Aquifer,
- 7,327 acre-feet per year in the Marathon Aquifer, and
- 57,754 to 58,580 acre-feet per year in the West Texas Bolsons Aquifer (Salt Basin and Presidio and Redford Bolsons combined).

Within the West Texas Bolsons Aquifer in Culberson County GCD, the modeled available groundwater for Lobo Flat, Wildhorse Flat, and Michigan Flat are:

- 11,087 to 11,112 acre-feet per year in Lobo Flat, and
- 24,422 to 24,638 acre-feet per year in Wildhorse Flat.

The modeled available groundwater estimates were extracted from results of model runs using the following groundwater availability models and alternative models: Bone Spring-Victorio Peak, Eastern Arm of the Capitan Reef Complex, Edwards-Trinity (Plateau), Igneous and West Texas Bolsons (Wild Horse Flat, Michigan Flat, Ryan Flat, and Lobo Flat), and West Texas Bolsons (Presidio and Redford) aquifers.

Analytical methods were used to calculate the modeled available groundwater for the Capitan Reef Complex Aquifer in Culberson County and for the Marathon Aquifer. The explanatory report and other materials submitted to the Texas Water Development Board (TWDB) were determined to be administratively complete on October 29, 2021.

REQUESTOR:

Groundwater Conservation District members of Groundwater Management Area 4.

DESCRIPTION OF REQUEST:

In the *Resolution for Adoption of Desired Future Conditions for the Aquifers in Groundwater Management Area 4* dated June 17, 2021, the District Members of Groundwater Management Area 4 provided the TWDB with the desired future conditions of the relevant aquifers in Groundwater Management Area 4. The 2021 desired future conditions are identical with the 2016 desired future conditions, and are reproduced below:

Brewster County Groundwater Conservation District (2010-2060)

- 3 feet drawdown for the Edwards-Trinity (Plateau) Aquifer.
- 10 feet drawdown for the Igneous Aquifer.
- 0-foot drawdown for the Marathon Aquifer.
- 0-foot drawdown for the Capitan Reef Complex Aquifer.

Culberson County Groundwater Conservation District (2010-2060)

- 50 feet drawdown for the Capitan Reef Complex Aquifer.
- 78 feet drawdown for the [Salt Basin portion of the] West Texas Bolsons Aquifer.
- 66 feet drawdown for the Igneous Aquifer.

Hudspeth County Underground Water Conservation District No.1 (2010-2060)

- 0-foot drawdown for the Bone Spring-Victorio Peak Aquifer, averaged across the portion of the aquifer within the boundaries of the District.

Jeff Davis County Underground Water Conservation District (2010-2060)

- 20 feet drawdown for the Igneous Aquifer.
- 72 feet drawdown for the [Salt Basin portion of the] West Texas Bolsons Aquifer.

Presidio County Underground Water Conservation District (2010-2060)

- 14 feet drawdown for the Igneous Aquifer.

- 72 feet drawdown for the [Salt Basin portion of the] West Texas Bolsons Aquifer.
- 72 feet drawdown for the Presidio-Redford Bolson [portion of the West Texas Bolsons].

The following stipulations from the 2016 desired future conditions also apply to the 2021 desired future conditions.

> "In response to requests for clarifications from the TWDB on December 5, 2017, December 8, 2017, and February 5, 2018 the Groundwater Management Area 4 Chair, Ms. Janet Adams, indicated the following preferences for calculating modeled available groundwater volumes in Groundwater Management Area 4:
>
> - For the Bone Spring-Victorio Peak Aquifer (Hudspeth County), the TWDB will use the results reported in GAM Run 10-061 and the assumptions described in GAM Task 10-006;
> - For the Capitan Reef Complex Aquifer (Brewster and Culberson counties), the TWDB will use the Capitan Reef Complex Aquifer (Eastern Arm) groundwater availability model for Brewster County and the analytical approach (AA 09-08) for Culberson County. For Brewster County we will use 2005 as the baseline year and for Culberson County we will use the assumptions described in AA 09-08. The TWDB will assume the desired future condition in Brewster County is met if the average simulated drawdown value is within 3 feet.
> - For the Edwards-Trinity (Plateau) Aquifer (Brewster County), the TWDB will use the single layer groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers, with 2005 as the baseline year and the assumptions described in GR 10-048.
> - For the Igneous Aquifer and Salt Basin Portion of the West Texas Bolsons Aquifer (Brewster, Culberson, Jeff Davis, and Presidio counties), the TWDB will use the Igneous and West Texas Bolsons aquifers groundwater availability model, with 2000 as the baseline year and the assumptions described in report GR 10-037 MAG.
> - For Presidio and Redford Bolsons portion of the West Texas Bolsons Aquifer, the TWDB will use the West Texas Bolsons Aquifer (Presidio and Redford Bolsons) groundwater availability model, with 2008 as the baseline year.

- The Red Light Draw, Green River Valley, and Eagle Flat portions of the West Texas Bolsons Aquifer are considered non-relevant for the purposes of joint planning because there are no groundwater conservation districts with jurisdiction over this portion of the minor aquifer."

METHODS:

The desired future conditions for the Bone Spring-Victorio Peak, Capitan Reef Complex (Culberson and Brewster counties), Marathon, Igneous, Edwards-Trinity (Plateau), and West Texas Bolsons (Wild Horse Flat, Michigan Flat, Ryan Flat, and Lobo Flat) aquifers are identical to the ones adopted in 2016, and the applicable groundwater availability models and analytical methodology to calculate modeled available groundwater are unchanged. With the exception of the West Texas Bolsons Aquifer (years 2060 and 2070, where modeled available groundwater increased slightly), the modeled available groundwater volumes presented for those aquifers are the same as those shown in the previous analytical assessments and model runs—GAM Task 10-061 (Oliver, 2011c), AA 09-08 (Wuerch and Davidson, 2010), AA 09-09 (Thorkildsen and Backhouse, 2010), GAM Run 10-048 (Oliver, 2012), and GAM Run 10-037 (Oliver, 2011a), and GAM Run 10-036 (Oliver, 2011b), GAM Run 16-030 (Boghici and Bradley, 2018), and GAM Run 16-030_Addendum (Wade, 2020).

Where analytical aquifer assessments were used, modeled available groundwater volumes were determined by summing estimates of effective recharge and the change in aquifer storage. See Freeze and Cherry (1979, p.365) for details regarding this analytical method.

Where groundwater availability models were used, the TWDB identified groundwater pumping scenarios that could achieve the adopted desired future conditions in Groundwater Management Area 4. The TWDB extracted simulated water levels for baseline years (see Parameters and Assumptions section for more information) and subsequent decades. The simulated drawdowns in all active model cells were averaged by aquifer for each county and groundwater conservation district. If water levels dropped below the base of the model cells during the predictive simulations, these cells became "dry cells". In some instances, dry cells were included in drawdown averages; in other instances, they were not. See the "Parameters and Assumptions" section for more details on the treatment of dry cells in each of the model runs.

The calculated drawdown averages compared well with the desired future conditions and verified that the desired future conditions adopted by the districts can be achieved—within the assumptions and limitations associated with each groundwater availability model. Modeled available groundwater volumes were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual

pumping rates were divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 4 (Figures 1 through 13 and Tables 1 through 12).

Modeled Available Groundwater and Permitting

Chapter 36 of the Texas Water Code defines "modeled available groundwater" as 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:

Bone Spring-Victorio Peak Aquifer

- The previous modeled available groundwater (Boghici and Bradley, 2018, Oliver, 2011c) was calculated using three separate flow models run under a variety of climatic and pumping scenarios. See Hutchison (2008) for assumptions and limitations of the three groundwater flow models.
- The models have one layer representing the Bone Spring-Victorio Peak Aquifer, a portion of the Capitan Reef Complex Aquifer, and the Diablo Plateau.
- Hutchison (2008) ran all three models using pumping ranging from 0 to 125,000 acre-feet per year and climatic information from tree ring data ranging from 1000 to 1988.
- The results of the 144 simulations were plotted to establish a relationship between pumping and drawdown (Hutchison, 2010). Modeled available groundwater was the sum of net pumping and the estimated irrigation return flow (approximately 30 percent of the net pumping, according to the Hudspeth County Underground Water Conservation District No. 1) for each desired future condition. Additional information on the application of irrigation return flow is described in GAM Run 10-061 MAG (Oliver, 2011c).
- Because the analysis used was statistically based, the starting and ending period can apply for any 50-year planning horizon. Therefore, we applied the values to 2020 to 2060 (2020 to 2070 for the Regional Water Planning Area (RWPA) table.

Capitan Reef Complex Aquifer (Brewster County only)

- Version 1.01 of the groundwater availability model of the Eastern Arm of the Capitan Reef Complex Aquifer was used, with a baseline year of 2005. See Jones (2016) for assumptions and limitations of the groundwater availability model. A new model run simulation was completed to determine modeled available groundwater that achieved the desired future condition.
- The model has five layers: Layer 1, the Edwards-Trinity (Plateau) and Pecos Valley aquifers; Layer 2, the Dockum Aquifer and the Dewey Lake Formation; Layer 3, the Rustler Aquifer; Layer 4, a confining unit made up of the Salado and Castile formations, and the overlying portion of the Artesia Group; and Layer 5, the Capitan Reef Complex Aquifer, part of the Artesia Group, and the Delaware Mountain Group. Layers 1 through 4 are intended to act solely as boundary conditions facilitating groundwater inflow and outflow relative to the Capitan Reef Complex Aquifer (Layer 5).
- The recharge used for the model simulation represents average recharge from 1931 through 2005 (last year of model calibration).
- Available water-level data from 2005 to 2010 for the Capitan Reef Complex Aquifer indicates that water level changes have been minimal. Therefore, applying the clarifications received from the Groundwater Management Area 4 on December 7, 2017, we concluded that a 2005-to-2055 predictive simulation is equivalent to a 2010-to-2060 predictive simulation.
- Desired future conditions were assumed met when the average drawdowns were within 1 foot of the adopted desired future condition.
- Drawdowns were averaged over the official aquifer extent.
- All active model cells were included in drawdown averaging.
- Used a predictive run that included modeled available groundwater volumes from cycle 2 of the desired future conditions process from neighboring groundwater management areas 3 and 7.
- Grid file vintage: 01/06/2020.

Capitan Reef Complex Aquifer (Culberson County only)

- There is no groundwater availability model for the Capitan Reef Complex Aquifer in Culberson County.

- The annual total pumping estimates were calculated as the sum of the annual effective recharge amount and the annual volume of water depleted from the aquifer based on the desired future condition.
- Recharge was assumed to be evenly distributed across the outcrop of the aquifer.
- Effective recharge estimates were based on springflow and surface hydrology, groundwater pumpage and water-level changes, and precipitation estimates.
- Annual volumes of water taken from storage were calculated by dividing the total volume of depletion, based on the desired future condition, by 50 years. For this report, we assumed the 50 years was 2010 to 2060.
- Calculated water-level declines were assumed to be uniform across the aquifer within its footprint area, and these calculated water-level declines did not exceed aquifer thickness.
- A detailed description of all parameters and assumptions is available in AA 09-08 (Wuerch and others, 2011).

Edwards-Trinity (Plateau) Aquifer (Brewster County)

- The alternate groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers was used for the desired future condition simulations. This model is an update to the previously developed groundwater availability model documented in Anaya and Jones (2009). See Hutchison and others (2011) and Anaya and Jones (2009) for assumptions and limitations of the model.
- The groundwater model has one layer representing the Pecos Valley Aquifer and the Edwards-Trinity (Plateau) Aquifer. In the relatively narrow area where both aquifers are present, the model is a lumped representation of both aquifers.
- The recharge used for the model simulation represents average recharge as described in Hutchison and others (2011).
- Per Clarification Letter 2017-1208, TWDB used 2005 as the baseline year for predictive model runs and drawdown averaging.
- Time interval for drawdown averaging was 2005-2060.
- Desired future conditions were assumed met when average drawdowns are within 1 foot of the adopted desired future conditions.
- Drawdowns were averaged over model extent.

- Dry model cells were excluded from drawdowns' averaging.
- Used a predictive run that included modeled available groundwater volumes from cycle 2 of the desired future conditions process from neighboring groundwater management areas 2, 3, and 7.
- Grid file vintage: 08/26/2015.

Igneous Aquifer

- Version 1.01 of the groundwater availability flow model for the Igneous and parts of the West Texas Bolson aquifers was used for this analysis with year 2000 as baseline. See Beach and others (2004) for assumptions and limitations of the model.
- The model includes three layers representing the Wild Horse Flat, Michigan Flat, Ryan Flat, and Lobo Flat portions of the West Texas Bolsons Aquifer (Layer 1), the Igneous Aquifer (Layer 2), and the underlying Cretaceous and Permian units (Layer3). Some areas of Layer 2 outside the boundary of the Igneous Aquifer are active in order to allow flow between Layer 1 and Layer 3.
- See GAM Task 10-028 (Oliver, 2010) for a full description of the methods and assumptions used in the groundwater availability model simulations.
- The averaging of drawdowns and modeled available groundwater calculations were based on model extent as opposed to the official aquifer footprint. The Igneous Aquifer model extent is a smoothed and somewhat smaller version of the official footprint of the Igneous Aquifer. A comparison of these two areas is shown in Figure 8.
- Per Clarification Letter 2017-1208, we used 2000 as the baseline year for predictive model runs and drawdown averaging. Time interval for drawdown averaging was 2000-2050, equivalent to 2010-2060 due to minimal change in water levels in wells from 2000 to 2010.
- Desired future conditions were assumed met when the average drawdowns are within 1 foot of the adopted desired future conditions
- Drawdowns were averaged over model extent.
- The predictive model run for this analysis resulted in water levels in some model cells dropping below the base elevation of the cell during the simulation. These cells were excluded from the averaging of drawdowns, which in turn resulted in

progressively lower pumping values through time. This is illustrated by the decline in modeled available groundwater (see Tables 7 and 8).

- Modeled available groundwater values are slightly changed for 2060 and 2070 when compared with those reported in GAM Run 16-030 (Boghici and Bradley, 2018). This is because the previously reported values were determined by extrapolating the 2010-2050 trend shown in Oliver (2010), while the current values have been extracted from the model run output directly.
- This predictive run was unique to Groundwater Management Area 4.
- Grid file vintage: 01/20/2020.

Marathon Aquifer

- The annual total pumping estimates was calculated as the sum of the annual effective recharge amount and the annual volume of water depleted from the aquifer based on the desired future condition.
- Recharge was assumed to occur evenly across the aerial extent of the aquifer.
- Average annual precipitation (1971 through 2000) from the Climatic Atlas of Texas (Narasimhan and others, 2008) was used to calculate annual effective recharge volumes.
- The draft annual total pumping estimates are the sum of the annual effective recharge amount and the annual volume of water depleted from the aquifer based on the draft desired future condition. Annual volumes were calculated by dividing the total volume by 50 years. For this report, we assumed the 50 years was 2010 to 2060.
- Calculated water level declines were estimated uniformly across the aquifer.
- A detailed description of all parameters and assumptions is available in AA 09-09 (Thorkildsen and Backhouse, 2010).

[Salt Basin portion of the] West Texas Bolsons (Wild Horse Flat, Michigan Flat, Ryan Flat, and Lobo Flat) Aquifer

- Version 1.01 of the groundwater availability flow model for the Igneous and parts of the West Texas Bolson aquifers was used for this analysis with year 2000 as baseline. See Beach and others (2004) for assumptions and limitations of the model.

- The model includes three layers representing the Wild Horse Flat, Michigan Flat, Ryan Flat and Lobo Flat portions of the West Texas Bolsons Aquifer (Layer 1), the Igneous Aquifer (Layer 2), and the underlying Cretaceous and Permian units (Layer3).
- See GAM Task 10-028 (Oliver, 2010) for a full description of the methods and assumptions used in the groundwater availability model simulations.
- The simulation was set up using average recharge as described in Beach and others (2004) and was run from 2000 to 2060.
- Per Clarification Letter 2017-1208, we used 2000 as the baseline year for predictive model runs and drawdown averaging. Time interval for drawdown averaging: 2000-2050, equivalent to 2010-2060 due to minimal change in water levels in wells from 2000 to 2010.
- For the West Texas Bolsons in Culberson County, we used the methodology and calculations described in GAM Run 16-030_Addendum (Wade, 2020) to split modeled available groundwater by individual Flats: Lobo, Wild Horse, and Michigan. Later on, at the request of Culberson County Groundwater Conservation District, we combined the totals for Wild Horse and Michigan flats, and reported them under Wild Horse Flat only in Tables 11 and 12.
- Drawdowns were averaged over model extent.
- Desired future conditions were assumed met when the average drawdowns were within 1 foot of the adopted desired future conditions.
- The predictive model run for this analysis resulted in water levels in some model cells dropping below the base elevation of the cell during the simulation. These cells have been excluded from the averaging of drawdowns, which in turn resulted in progressively lower pumping values through time. This is illustrated by the decline in modeled available groundwater (see Tables 11 and 12).
- Modeled available groundwater values are slightly changed for 2060 and 2070 when compared with those reported in GAM Run 16-030 (Boghici and Bradley, 2018). This is because the previously reported values were determined by extrapolating the 2010-2050 trend shown in Oliver (2010), while the current values have been extracted from the model run output directly.
- Predictive run was unique to Groundwater Management Area 4.
- Grid file vintage: 01/20/2020.

West Texas Bolsons (Presidio and Redford) Aquifer

- Version 1.01 of the groundwater availability model of the Presidio and Redford bolsons of the West Texas Bolsons Aquifer was used with a baseline year of 2008. A new model run simulation was completed to determine the modeled available groundwater that achieved the desired future condition.
- The model includes three layers representing the Rio Grande Alluvium (layer 1), West Texas Bolsons (Presidio and Redford) Aquifer (layer 2), and Tertiary and Cretaceous units (layer 3).
- See Wade and Jigmond (2013) for assumptions and limitations of the groundwater availability model.
- The recharge used for the simulation represents average recharge from 1948 through 2008 (end year of model calibration). Pumping was adjusted in all model layers and on both the United States and the Mexico sides of the aquifer during the predictive run simulations.
- An analysis of the Presidio and Redford bolsons indicate that there have been minimal changes in water levels in the few wells with available data from 2008 through 2010. Therefore, consistent with the clarifications received from the Groundwater Management Area 4 on December 7, 2017, we assumed that a 2008-to-2058 predictive simulation is equivalent to a 2010-to-2060 predictive simulation.
- Drawdowns were calculated by subtracting 2008 simulated water levels from 2058 simulated water levels which were then averaged for all active model cells in Layer 1 and Layer 2 within the official aquifer boundary in Presidio County. Drawdowns in model cells located in Mexico were excluded from averaging. We assumed the desired future condition was met if the average drawdown value was within 1 foot.
- Predictive run was unique to Groundwater Management Area 4.
- Grid file vintage: 1/20/2020.

RESULTS:[1]

The results for the groundwater conservation districts (Tables 1, 3, 5, 7, 9, and 11), reflect the ending year discussed in the Parameters and Assumption Section of this report. For planning purposes (Tables 2, 4, 6, 8, 10, and 12), the modeled available groundwater values have been populated past the dates defined by the desired future conditions resolutions using predictive model run results. Tables 1 through 12 show the combination of modeled available groundwater summarized (1) by groundwater conservation district and county; and (2) by county, river basin, and regional water planning area for use in the regional water planning process.

The modeled available groundwater that achieves the desired future conditions adopted by Groundwater Management Area 4 is:

- 101,400 acre-feet per year from 2020 to 2060/2080 (Tables 1 and 2) for the Bone Spring-Victorio Peak Aquifer. These volumes represent total pumping, defined as the sum of net pumping and the irrigation return flow. Hudspeth County Underground Water Conservation District No. 1 estimates that irrigation return flow is about 30 percent of net pumping.
- 8,163 acre-feet per year from 2020 to 2060/2080 (Tables 3 and 4) for the Capitan Reef Complex Aquifer. This value includes 583 acre-feet per year in Brewster County; 7,580 acre-feet per year in Culberson County.
- 1,394 acre-feet per year from 2020 to 2060/2080 (Tables 5 and 6) for the Edwards-Trinity (Plateau) Aquifer.
- 11,336 to 11,331/11,331 acre-feet per year between 2020 and 2060/2080 (Tables 7 and 8) for the Igneous Aquifer.
- 7,327 acre-feet per year from 2020 to 2060/2080 (Tables 9 and 10) for the Marathon Aquifer.
- 58,580 to 57,754 acre-feet per year between 2020 and 2060/2080 (Tables 11 and 12) for the West Texas Bolsons (including the Salt Bolson and Presidio and Redford Bolsons).

[1] Note: Since the desired future conditions were defined by Groundwater Management Area 4 only to year 2060, the groundwater pumping volumes reported past 2060 in Tables 1-12 may not honor said desired future conditions. The 2070 and 2080 pumping volumes are reported here as *Groundwater Availability* for use by the regional water planning areas.

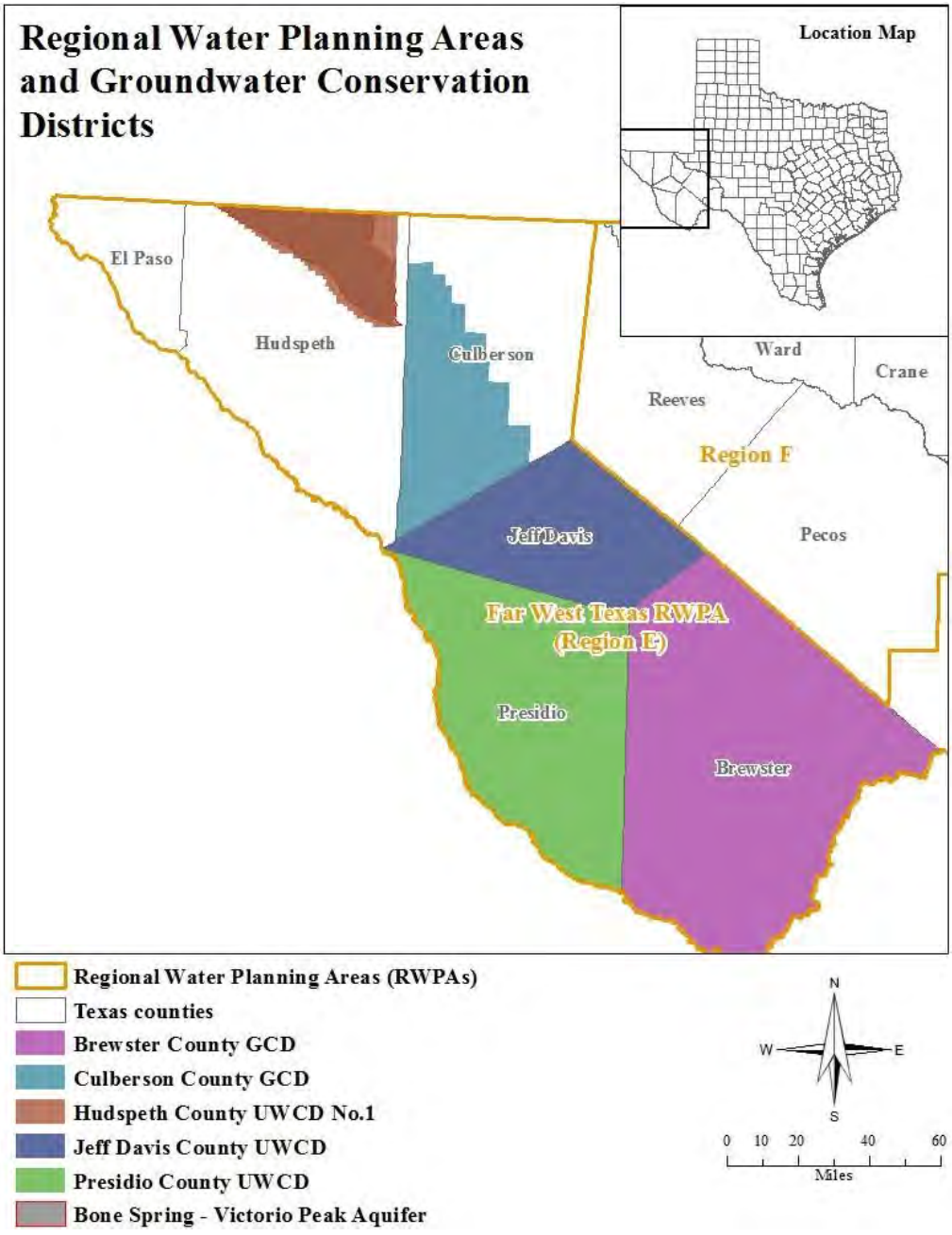

FIGURE 1. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD), AND COUNTIES IN THE VICINITY OF THE BONE SPRING–VICTORIO PEAK AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

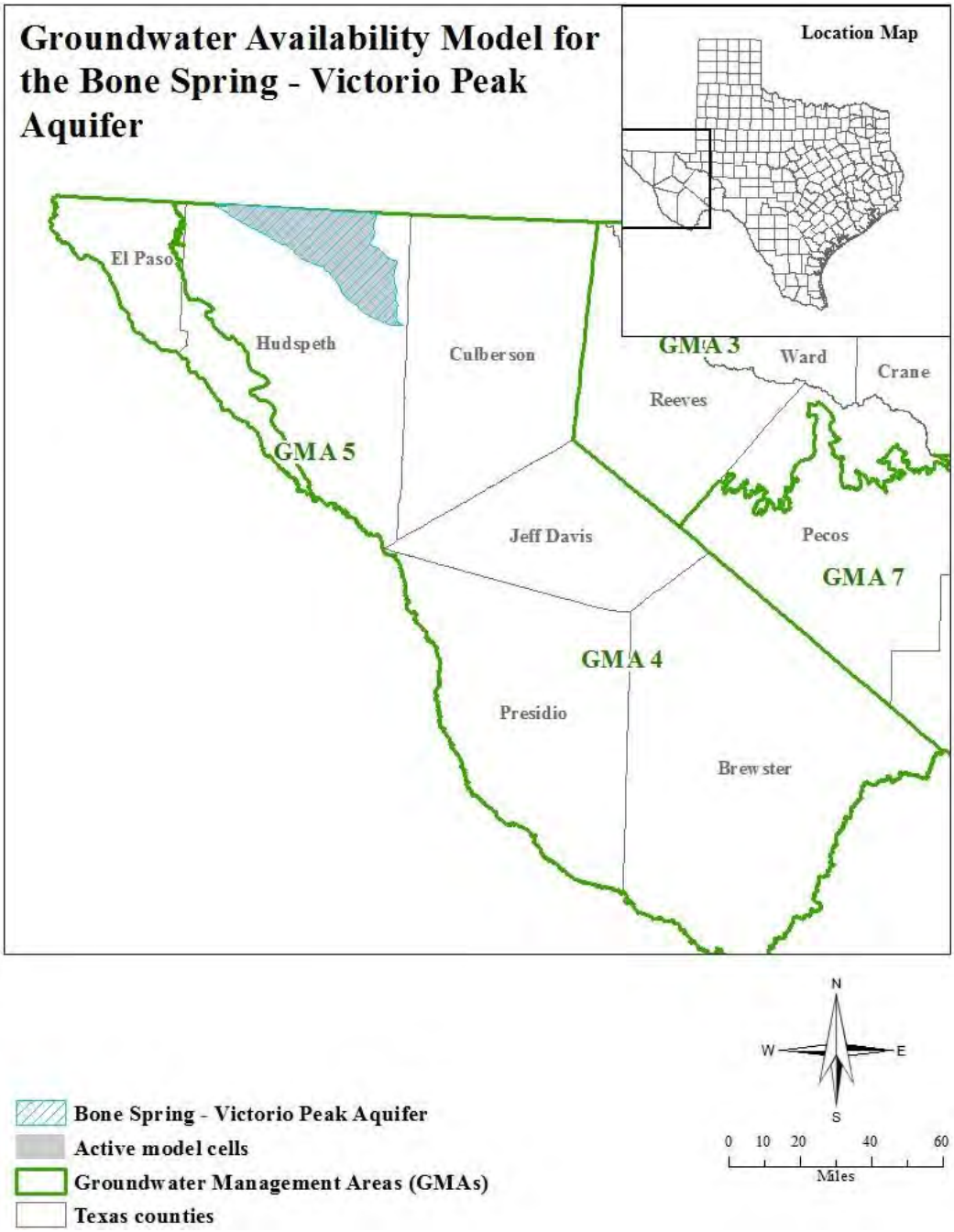

FIGURE 2. AREA COVERED BY THE GROUNDWATER AVAILABILITY MODEL FOR THE BONE SPRING-VICTORIO PEAK AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE BONE SPRING- VICTORIO PEAK AQUIFER IN GROUNDWATER MANAGEMENT AREA 4SUMMARIZED BY UNDERGROUND WATER CONSERVATION DISTRICT (UWCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2020	2030	2040	2050	2060
Hudspeth County UWCD	Hudspeth	101,400	101,400	101,400	101,400	101,400
No district-County	Hudspeth	0	0	0	0	0
Total		**101,400**	**101,400**	**101,400**	**101,400**	**101,400**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE BONE SPRING-VICTORIO PEAK AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070	2080
Hudspeth	E	Rio Grande	101,400	101,400	101,400	101,400	101,400	101,400	101,400
Total			**101,400**	**101,400**	**101,400**	**101,400**	**101,400**	**101,400**	**101,400**

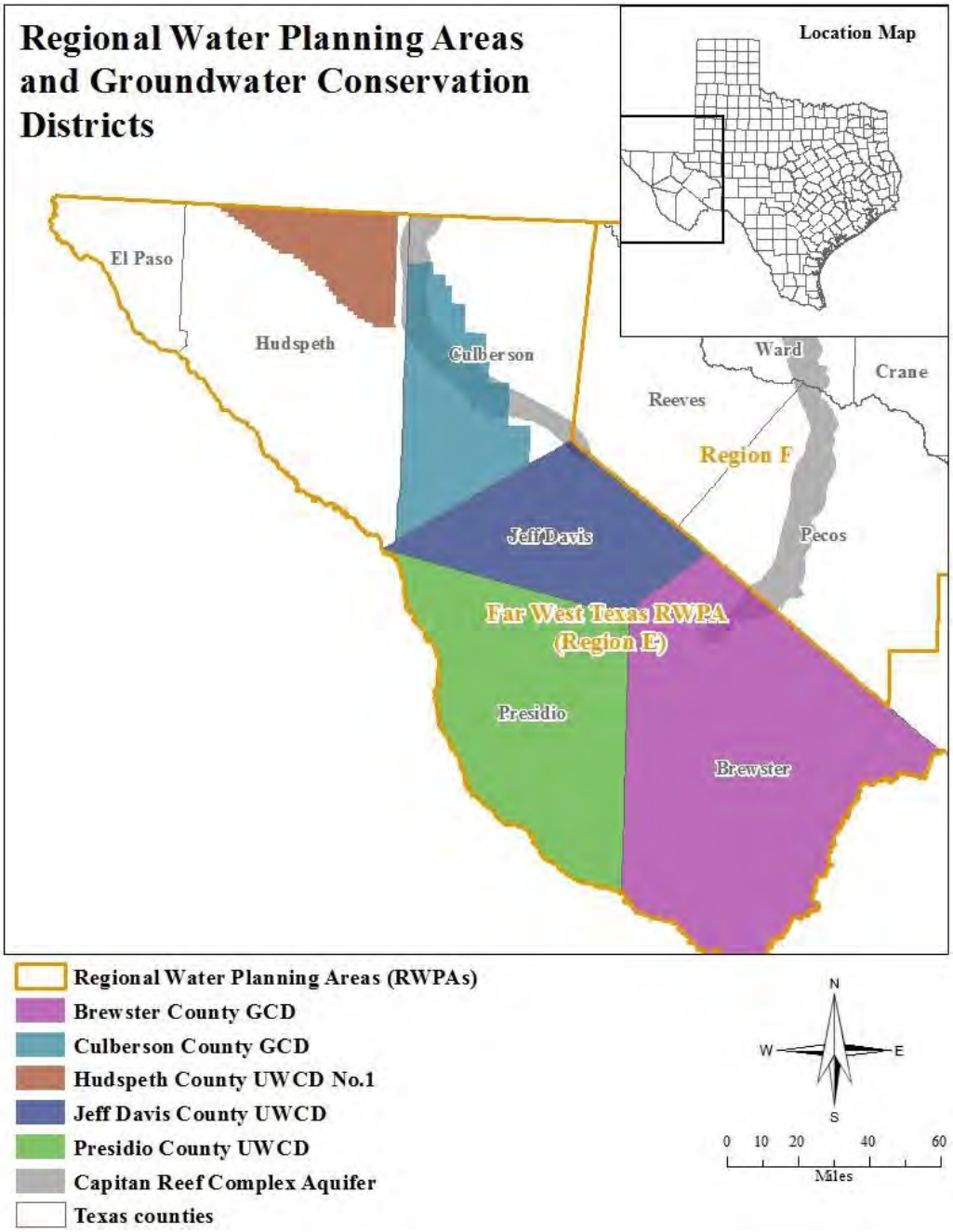

FIGURE 3. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD), AND COUNTIES IN THE VICINITY OF THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

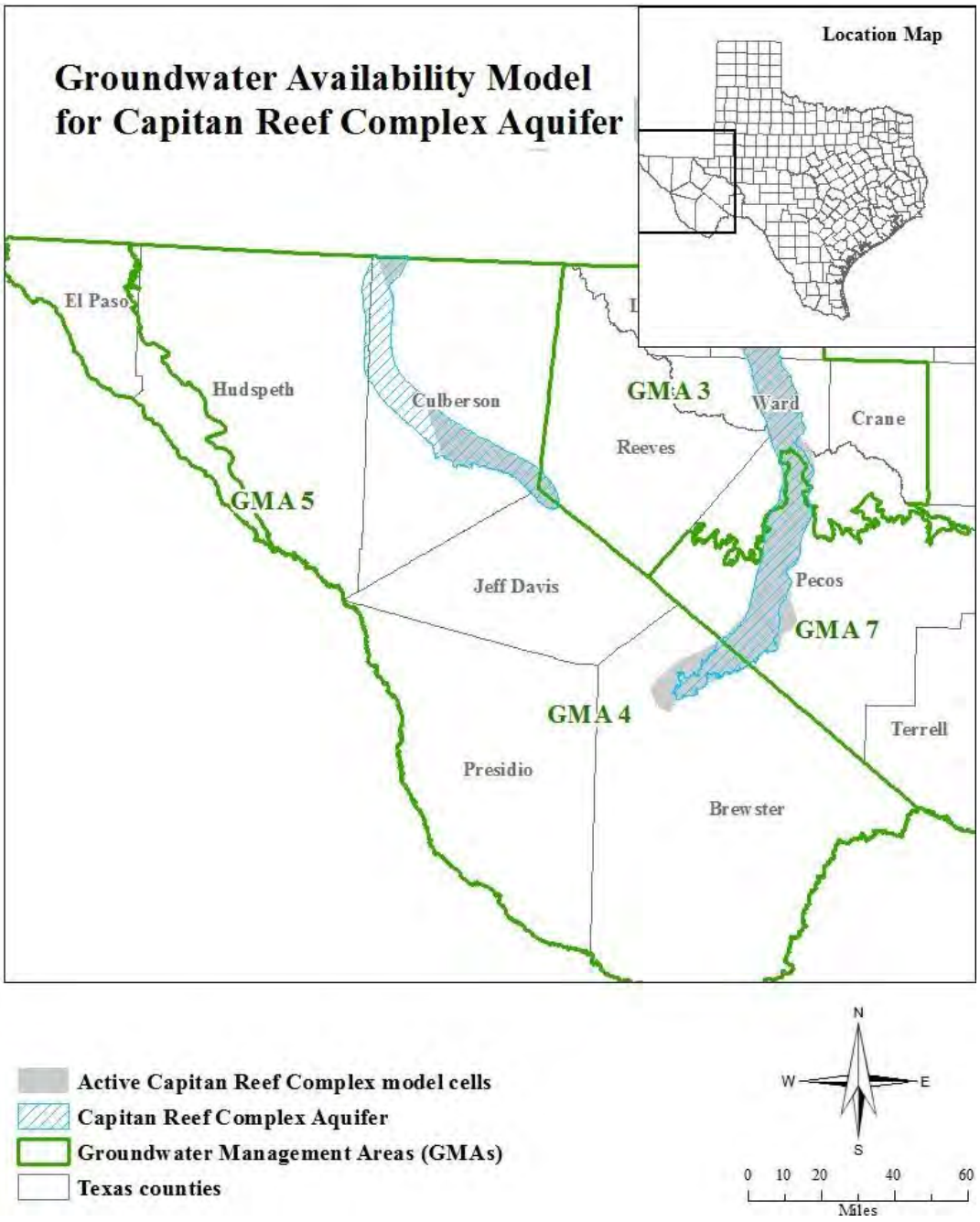

FIGURE 4. AREAS COVERED BY THE GROUNDWATER AVAILABILITY MODEL FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2020	2030	2040	2050	2060
Brewster County GCD	Brewster	583	583	583	583	583
Culberson County GCD	Culberson	7,580	7,580	7,580	7,580	7,580
Total		**8,163**	**8,163**	**8,163**	**8,163**	**8,163**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070	2080
Brewster	E	Rio Grande	583	583	583	583	583	583	583
Culberson	E	Rio Grande	7,580	7,580	7,580	7,580	7,580	7,580	7,580
Total			**8,163**	**8,163**	**8,163**	**8,163**	**8,163**	**8,163**	**8,163**

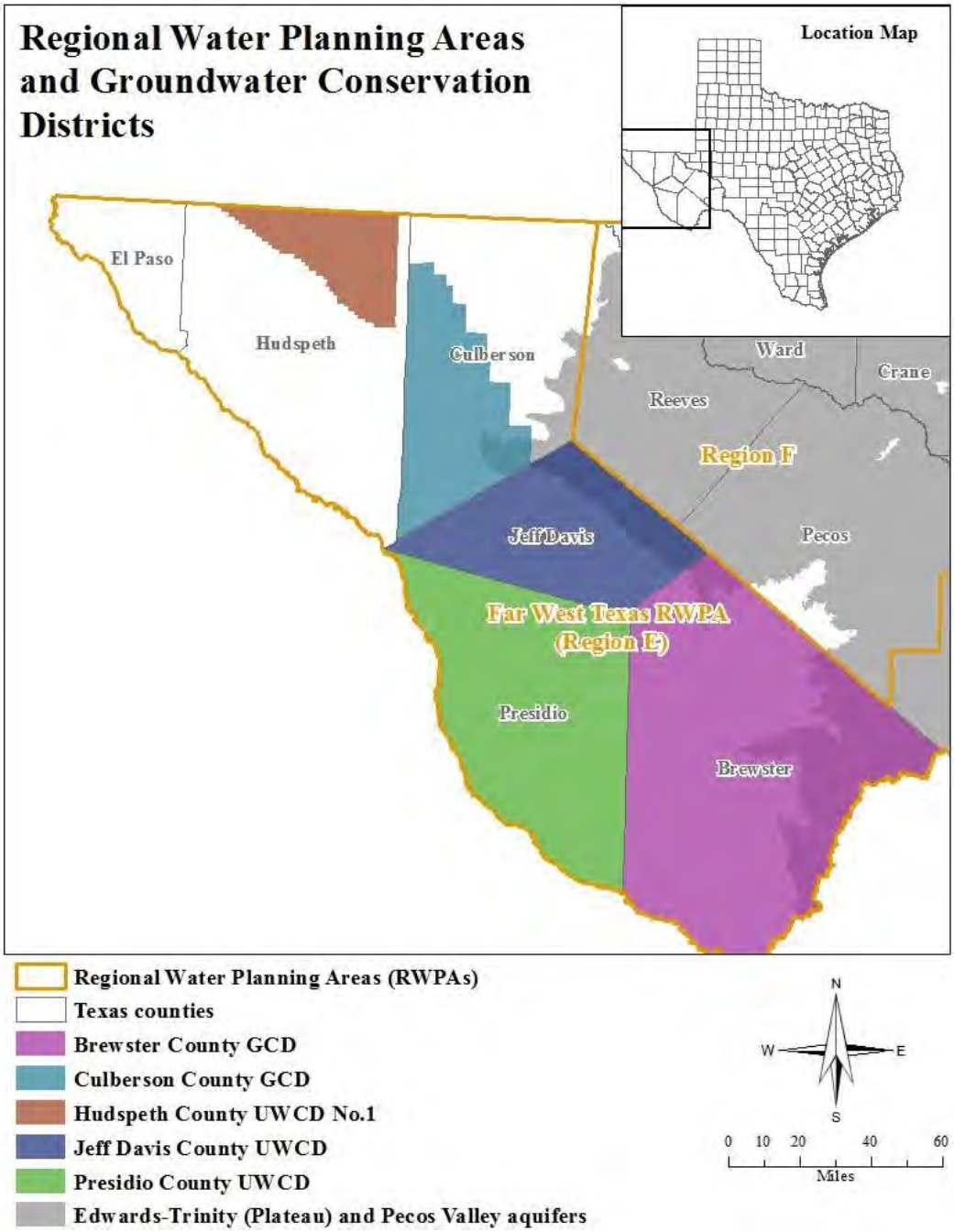

FIGURE 5. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATIONDISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD), AND COUNTIES IN THE VICINITY OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

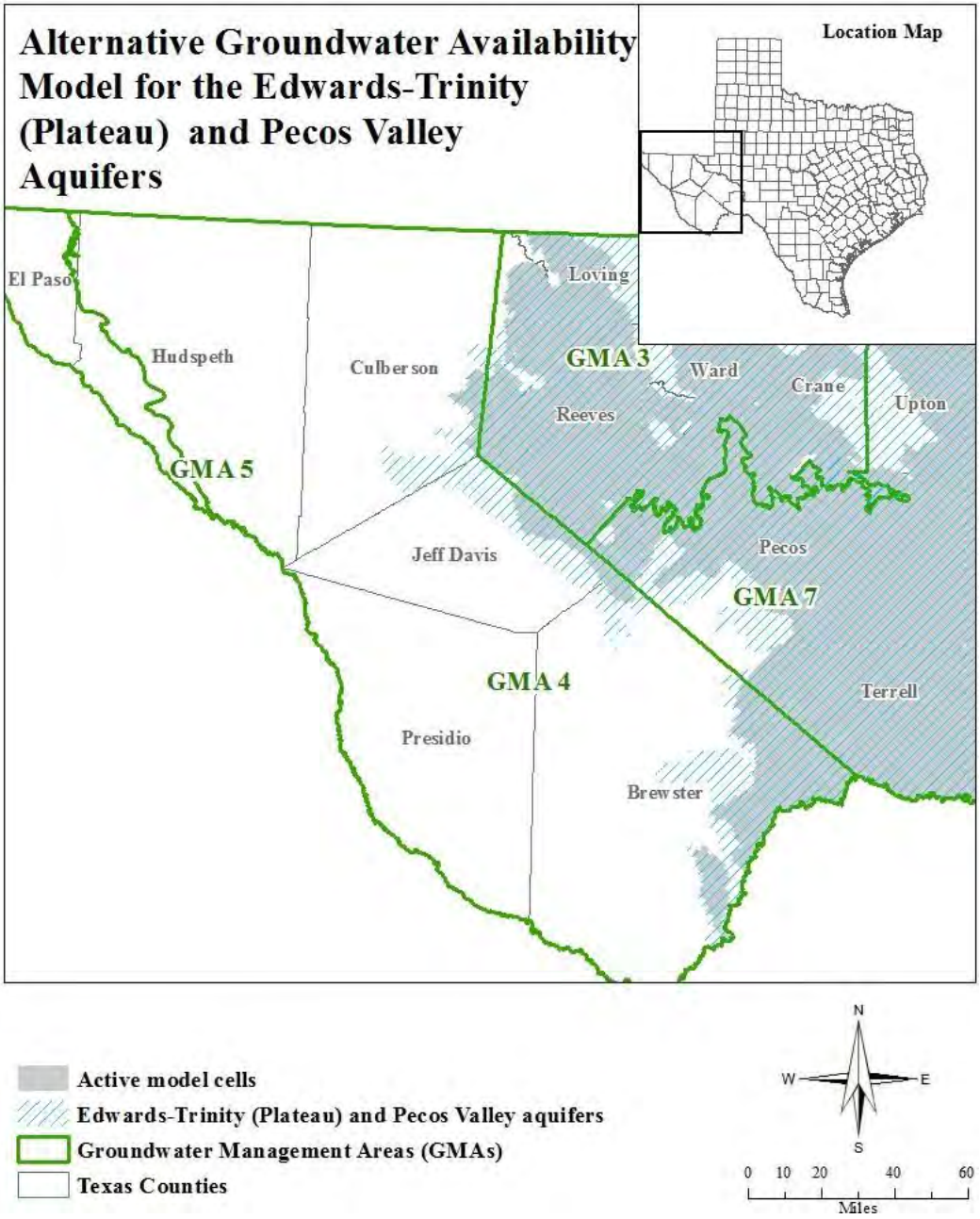

FIGURE 6. AREAS COVERED BY THE ALTERNATIVE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2020	2030	2040	2050	2060
Brewster County GCD	Brewster	1,394	1,394	1,394	1,394	1,394
Total		**1,394**	**1,394**	**1,394**	**1,394**	**1,394**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070	2080
Brewster	E	Rio Grande	1,394	1,394	1,394	1,394	1,394	1,394	1,394
Total			**1,394**	**1,394**	**1,394**	**1,394**	**1,394**	**1,394**	**1,394**

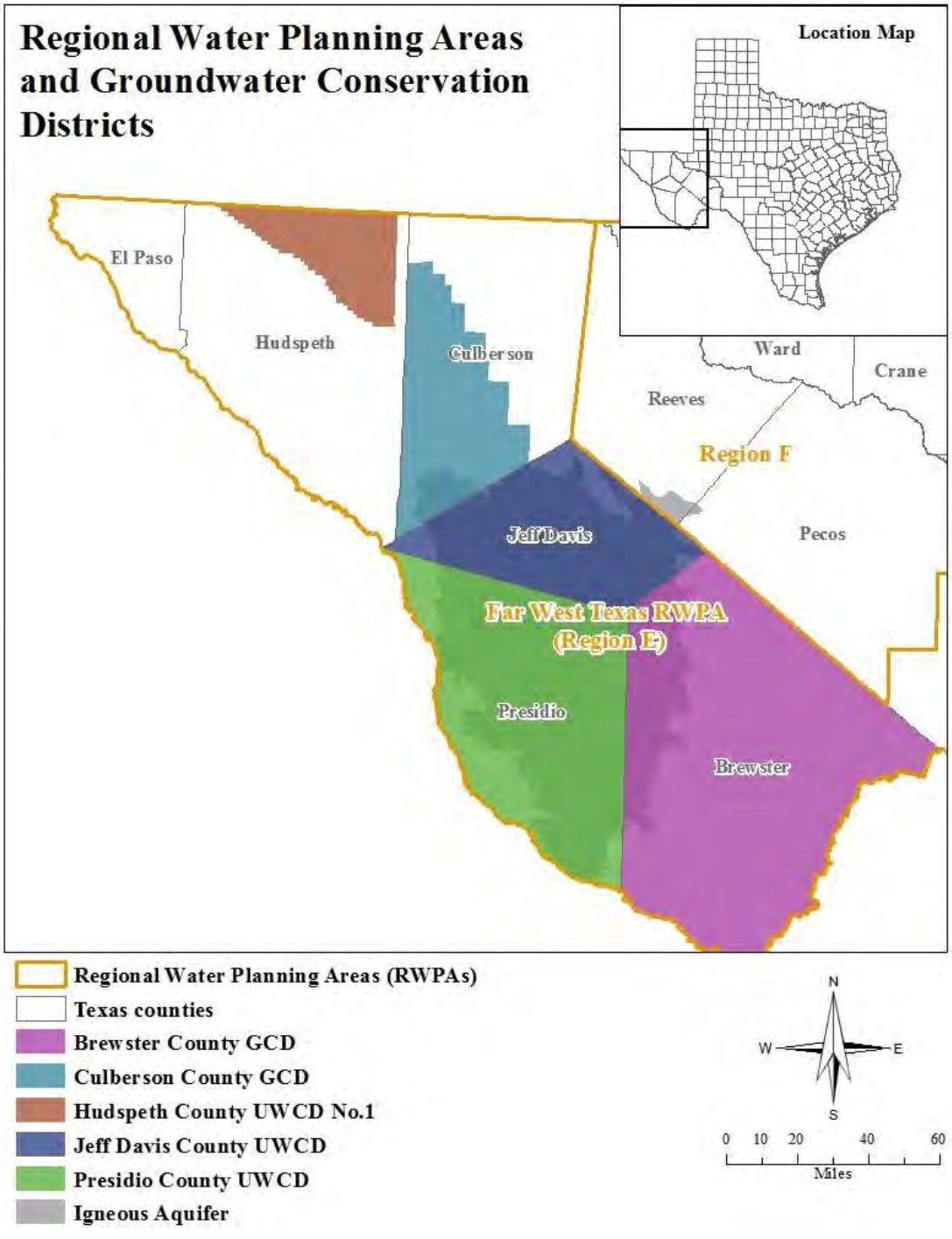

FIGURE 7. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD), AND COUNTIES IN THE VICINITY OF THE IGNEOUS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

FIGURE 8. AREAS COVERED BY THE GROUNDWATER AVAILABILITY MODEL FOR THE IGNEOUS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE IGNEOUS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD), UNDERGROUND WATER CONSERVATION DISTRICT (UWCD), AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2020	2030	2040	2050	2060
Brewster County GCD	Brewster	2,587	2,587	2,586	2,583	2,582
Culberson County GCD	Culberson	99	99	99	99	99
Jeff Davis County UWCD	Jeff Davis	4,585	4,585	4,585	4,585	4,585
Presidio County UWCD	Presidio	4,065	4,065	4,065	4,065	4,065
Total		**11,336**	**11,336**	**11,335**	**11,332**	**11,331**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE IGNEOUS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070	2080
Brewster	E	Rio Grande	2,587	2,587	2,586	2,583	2,582	2,582	2,582
Culberson	E	Rio Grande	99	99	99	99	99	99	99
Jeff Davis	E	Rio Grande	4,585	4,585	4,585	4,585	4,585	4,585	4,585
Presidio	E	Rio Grande	4,065	4,065	4,065	4,065	4,065	4,065	4,065
Total			**11,336**	**11,336**	**11,335**	**11,332**	**11,331**	**11,331**	**11,331**

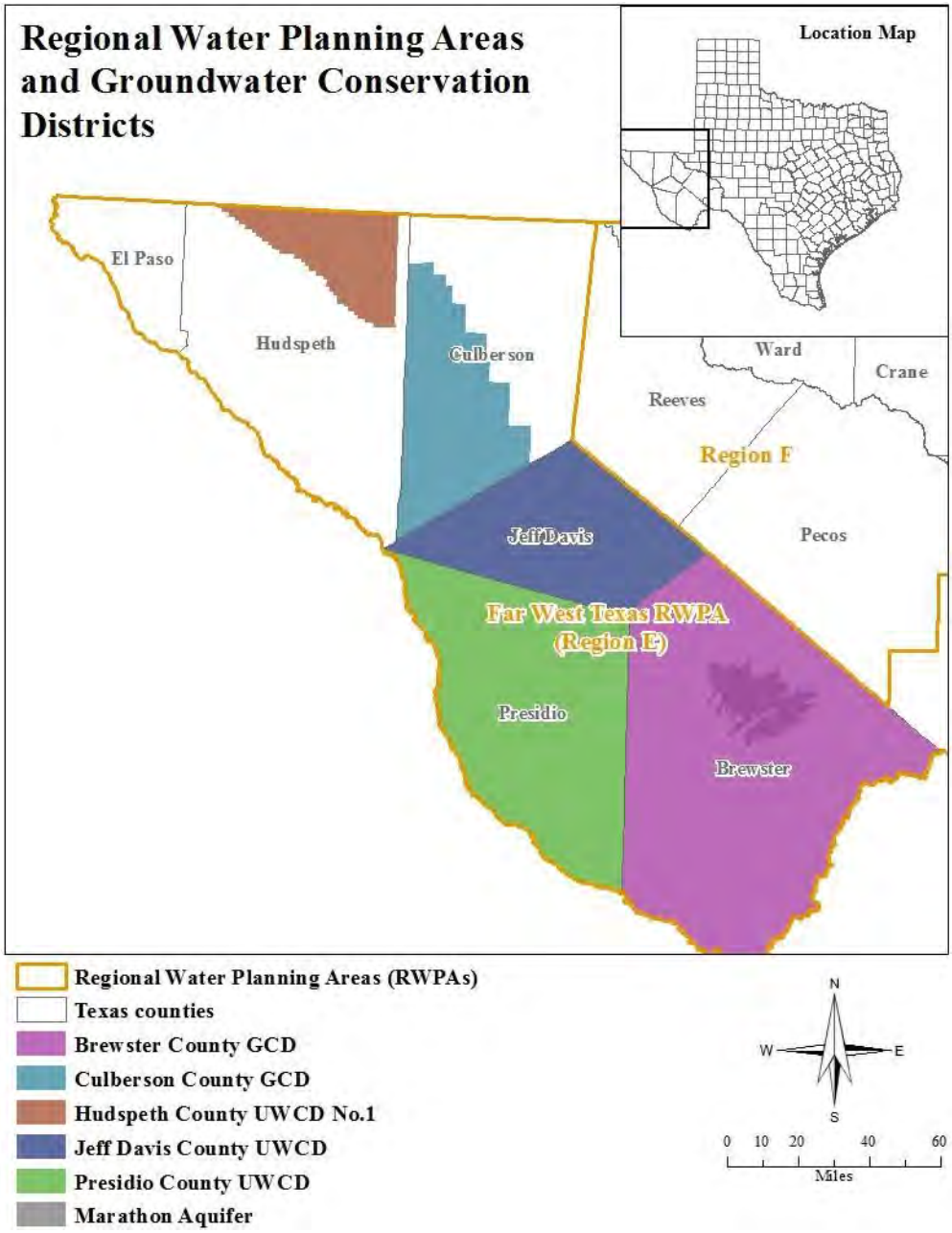

FIGURE 9. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD), AND COUNTIES IN THE VICINITY OF THE MARATHON AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

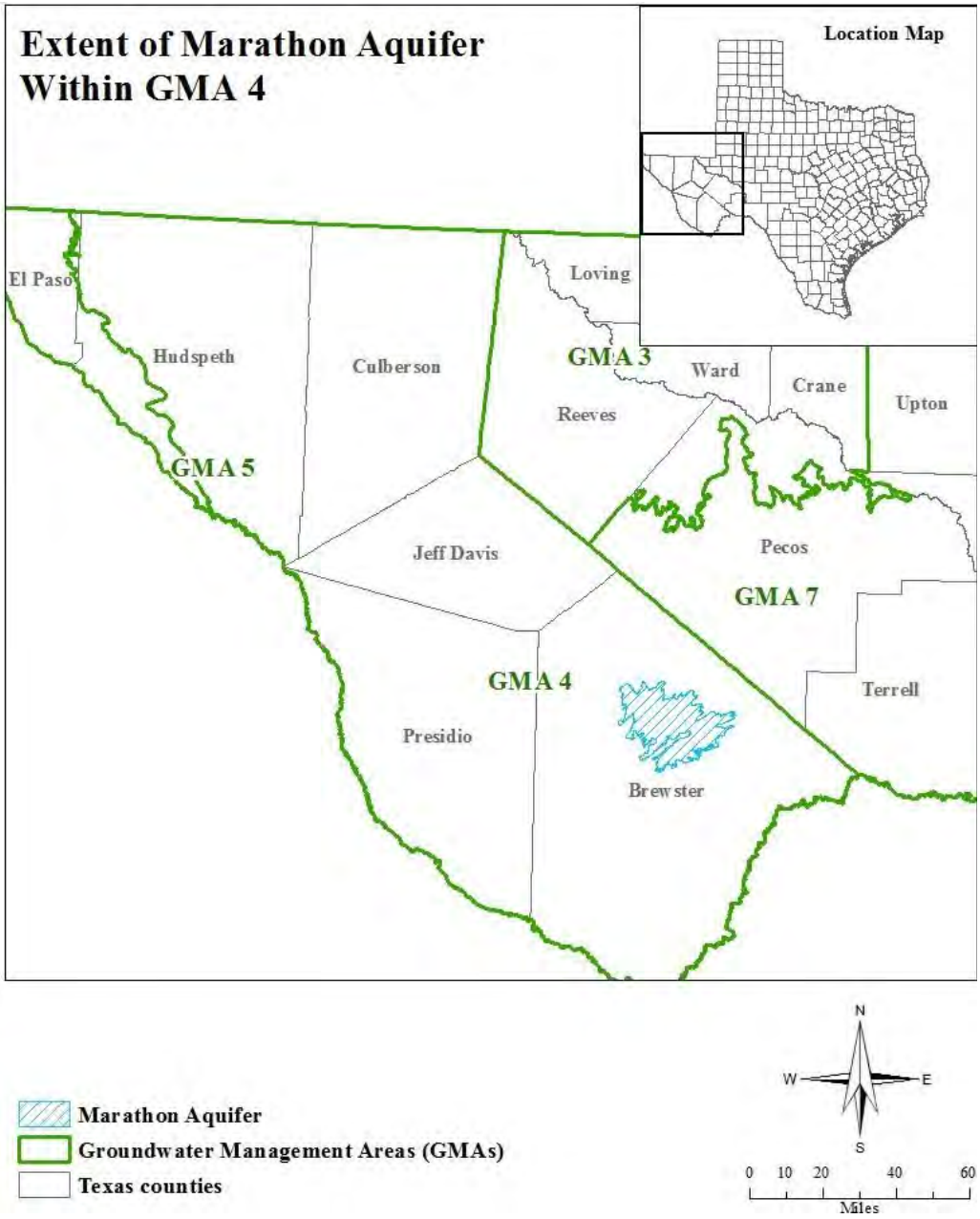

FIGURE 10. GROUNDWATER MANAGEMENT AREAS (GMAS) AND COUNTIES IN THE VICINITY OF THE MARATHON AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE MARATHON AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2020	2030	2040	2050	2060
Brewster County GCD	Brewster	7,327	7,327	7,327	7,327	7,327
Total		**7,327**	**7,327**	**7,327**	**7,327**	**7,327**

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MARATHON AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070	2080
Brewster	E	Rio Grande	7,327	7,327	7,327	7,327	7,327	7,327	7,327
Total			**7,327**	**7,327**	**7,327**	**7,327**	**7,327**	**7,327**	**7,327**

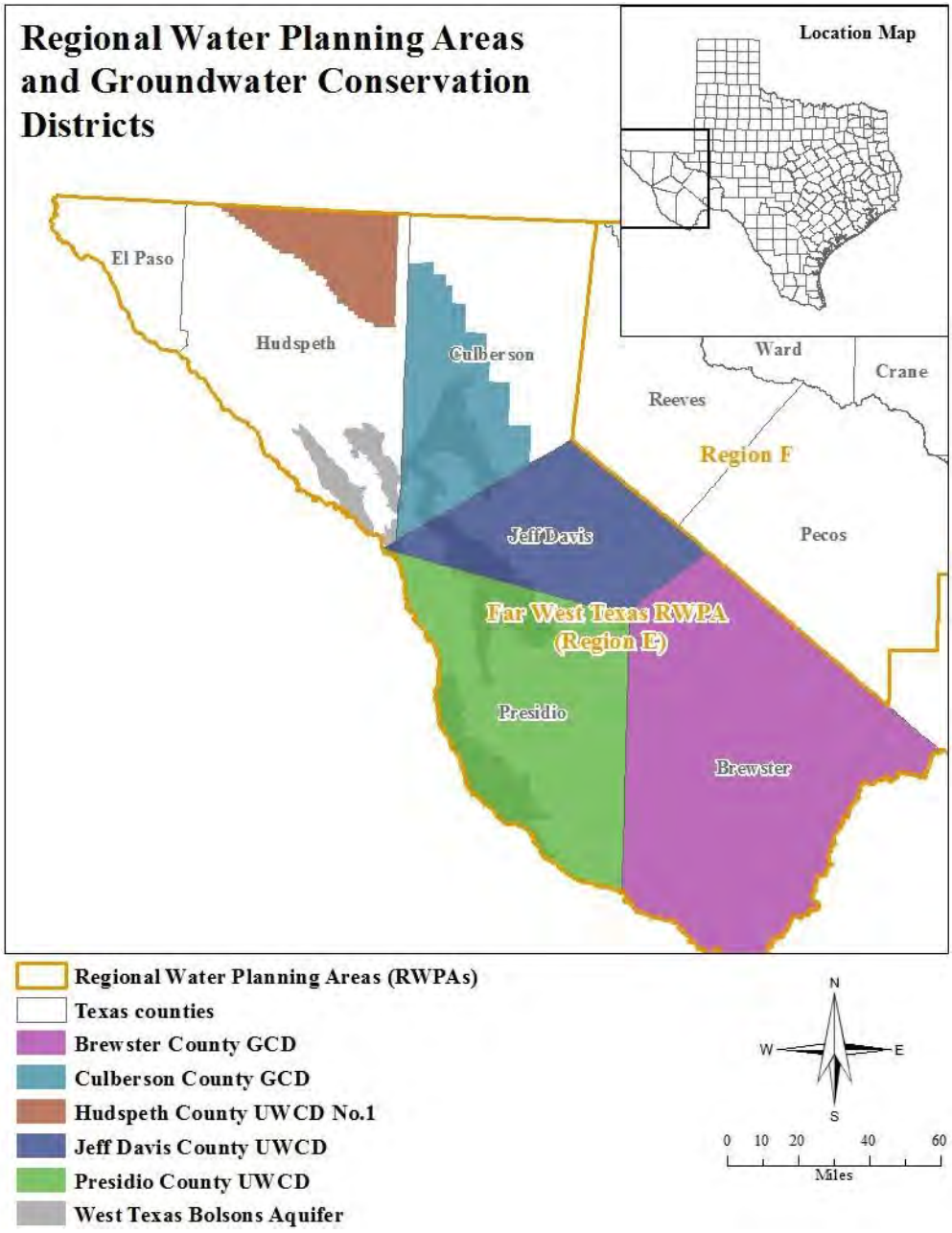

FIGURE 11. REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), UNDERGROUND WATER CONSERVATION DISTRICTS (UWCD) AND COUNTIES IN THE VICINITY OF THE WEST TEXAS BOLSONS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

FIGURE 12. AREAS COVERED BY THE GROUNDWATER AVAILABILITY MODEL FOR WILD HORSE FLAT, MICHIGAN FLAT, RYAN FLAT, AND LOBO FLAT PORTIONS OF THE WEST TEXAS BOLSONS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

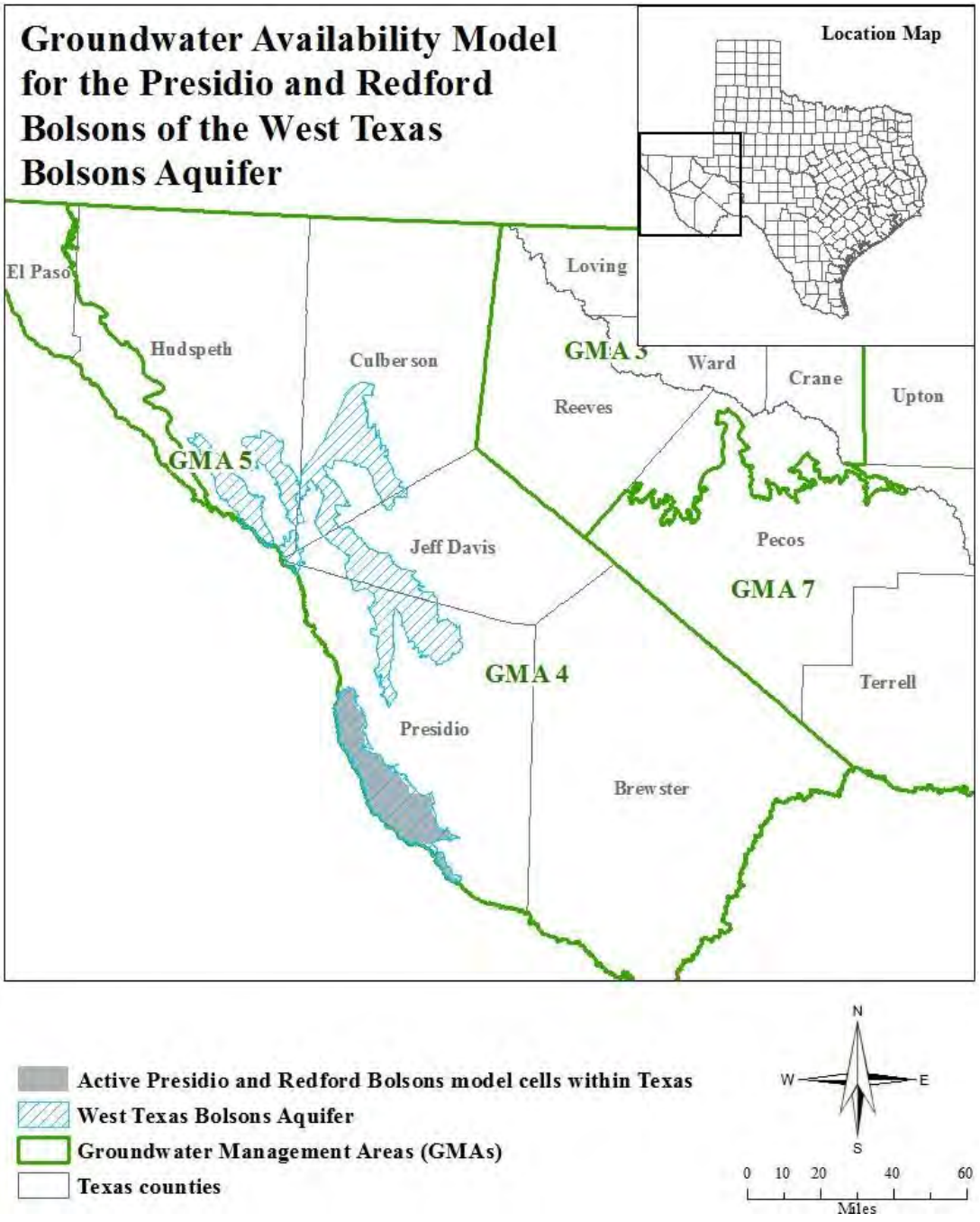

FIGURE 13. AREAS COVERED BY THE GROUNDWATER AVAILABILITY MODEL FOR THE PRESIDIO AND REDFORD PORTIONS OF THE WEST TEXAS BOLSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 4.

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE WEST TEXAS BOLSONS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD), UNDERGROUND WATER CONSERVATION DISTRICT (UWCD), COUNTY, AND AQUIFER SEGMENT FOR EACH DECADE BETWEEN 2020 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR. THE SALT BASIN PORTION OF THE WEST TEXAS BOLSONS AQUIFER INCLUDES WILD HORSE, MICHIGAN, LOBO FLATS, AND RYAN FLAT.

Groundwater Conservation District	County	Aquifer Segment	2020	2030	2040	2050	2060
Culberson County GCD	Culberson	Lobo Flat	11,112	11,112	11,097	11,092	11,087
		Wild Horse Flat	24,638	24,566	24,504	24,459	24,422
Culberson County GCD total			**35,750**	**35,678**	**35,601**	**35,551**	**35,509**
Jeff Davis County UWCD	Jeff Davis	Ryan Flat	6,056	6,056	5,989	5,961	5,942
Jeff Davis County UWCD total			**6,056**	**6,056**	**5,989**	**5,961**	**5,942**
Presidio County UWCD	Presidio	Ryan Flat	9,113	8,983	8,835	8,711	8,642
		Presidio and Redford Bolsons	7,661	7,661	7,661	7,661	7,661
Presidio County UWCD total			**16,774**	**16,644**	**16,496**	**16,372**	**16,303**
GMA 4 TOTAL			**58,580**	**58,378**	**58,086**	**57,884**	**57,754**

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE WEST TEXAS BOLSONS AQUIFER IN GROUNDWATER MANAGEMENT AREA 4 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER SEGMENT FOR EACH DECADE BETWEEN 2020 AND 2080. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer Segment	2020	2030	2040	2050	2060	2070	2080
Culberson	E	Rio Grande	Lobo Flat	11,112	11,112	11,097	11,092	11,087	11,061	11,040
		Rio Grande	Wild Horse Flat	24,638	24,566	24,504	24,459	24,422	24,358	24,307
Culberson County total				**35,750**	**35,678**	**35,601**	**35,551**	**35,509**	**35,419**	**35,347**
Jeff Davis	E	Rio Grande	Ryan Flat	6,056	6,056	5,989	5,961	5,942	5,904	5,876
Jeff Davis County total				**6,056**	**6,056**	**5,989**	**5,961**	**5,942**	**5,904**	**5,876**
Presidio	E	Rio Grande	Ryan Flat	9,113	8,983	8,835	8,711	8,642	8,586	8,503
			Presidio and Redford	7,661	7,661	7,661	7,661	7,661	7,661	7,661
Presidio County total				**16,774**	**16,644**	**16,496**	**16,372**	**16,303**	**16,247**	**16,164**
GMA 4 TOTAL				**58,580**	**58,378**	**58,086**	**57,884**	**57,754**	**57,570**	**57,387**

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.

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GAM Run 23-014: Hudspeth County Underground Water Conservation District No. 1 Management Plan

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512-463-5604
June 6, 2023

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6/6/2023

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GAM RUN 23-014: HUDSPETH COUNTY UNDERGROUND WATER CONSERVATION DISTRICT NO. 1 MANAGEMENT PLAN

Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
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512-463-5604
June 6, 2023

EXECUTIVE SUMMARY:

Texas Water Code § 36.1071(h), 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 Hudspeth County Underground Water Conservation District No. 1 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, which includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;
2. the 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; 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 Hudspeth County Underground Water Conservation District No. 1 should be adopted by the district on or before September 29, 2023 and submitted to the TWDB Executive Administrator on or before October 29, 2023. The current management plan for the Hudspeth County Underground Water Conservation District No. 1 expires on December 28, 2023.

We used version 1.01 of the groundwater availability model for the Bone Spring-Victorio Peak Aquifer (Hutchison, 2008) to estimate the management plan information for the Bone Spring-Victorio Peak Aquifer within Hudspeth County Underground Water Conservation District No. 1.

This report replaces the results of GAM Run 11-020 (Jones, 2012). Values may differ from the previous report as a result of routine updates to the spatial grid file used to define county, groundwater conservation district, and aquifer boundaries, which can impact the calculated water budget values. Additionally, the approach used for analyzing model results is reviewed during each update and may have been refined to better delineate groundwater flows. Table 1 summarizes the groundwater availability model data required by statute. Figure 1 shows the area of the respective models from which the values in Table 1 were extracted. Figure 2 provides a generalized diagram of the groundwater flow components provided in Table 1. If, after review of the figures, the Hudspeth County Underground Water Conservation District No. 1 determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

The flow components presented in this report do not represent the full groundwater budget. If additional inflow and outflow information would be helpful for planning purposes, the district may submit a request in writing to the TWDB Groundwater Modeling Department for the full groundwater budget.

METHODS:

In accordance with Texas Water Code § 36.1071(h), the groundwater availability model mentioned above was used to estimate information for the Hudspeth County Underground Water Conservation District No. 1 management plan. Water budgets were extracted for the historical calibration period for the Bone Spring-Victorio Peak Aquifer (1980 through 2002), using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface-water outflow, inflow to the district, outflow from the district, and the flow between aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Bone Spring-Victorio Peak Aquifer

- We used version 1.01 of the groundwater availability model for the Bone Spring-Victorio Peak Aquifer. See Hutchison (2008) for assumptions and limitations of the model.
- The groundwater availability model for the Bone-Spring-Victorio Peak Aquifer contains one layer, which generally corresponds to the Bone Spring-Victorio Peak Aquifer, and parts of the Diablo Plateau, Salt Basin and Capitan Reef Complex Aquifer. Within Hudspeth County Underground Water District No. 1, the model primarily represents the Bone-Spring-Victorio Peak Aquifer which includes the Bone Spring Limestone and the Victorio Peak Limestone hydrostratigraphic units.
- Water budget terms were averaged for the period 1980 to 2002 (stress periods 34 through 56)
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving an aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Bone Spring-Victorio Peak Aquifer located within the Hudspeth County Underground Water Conservation District No. 1 and averaged over the historical calibration period, as shown in Table 1.

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

The information needed for the district's management plan is summarized in Table 1. Figure 1 shows the area of the respective models from which the values in Table 1 were extracted. Figure 2 provides a generalized diagram of the groundwater flow components provided in Table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located.

Table 1: Summarized information for the Bone Spring-Victorio Peak Aquifer for the Hudspeth County Underground Water Conservation District No. 1 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	Bone Spring-Victorio Peak	256
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Bone Spring-Victorio Peak	0
Estimated annual volume of flow into the district within each aquifer in the district	Bone Spring-Victorio Peak	1,247
Estimated annual volume of flow out of the district within each aquifer in the district	Bone Spring-Victorio Peak	1,171
Estimated net annual volume of flow between each aquifer in the district	To Bone Spring-Victorio Peak Aquifer from equivalent and adjacent units within district	13,176
	To Bone Spring-Victorio Peak Aquifer from equivalent and adjacent units in New Mexico	58,157

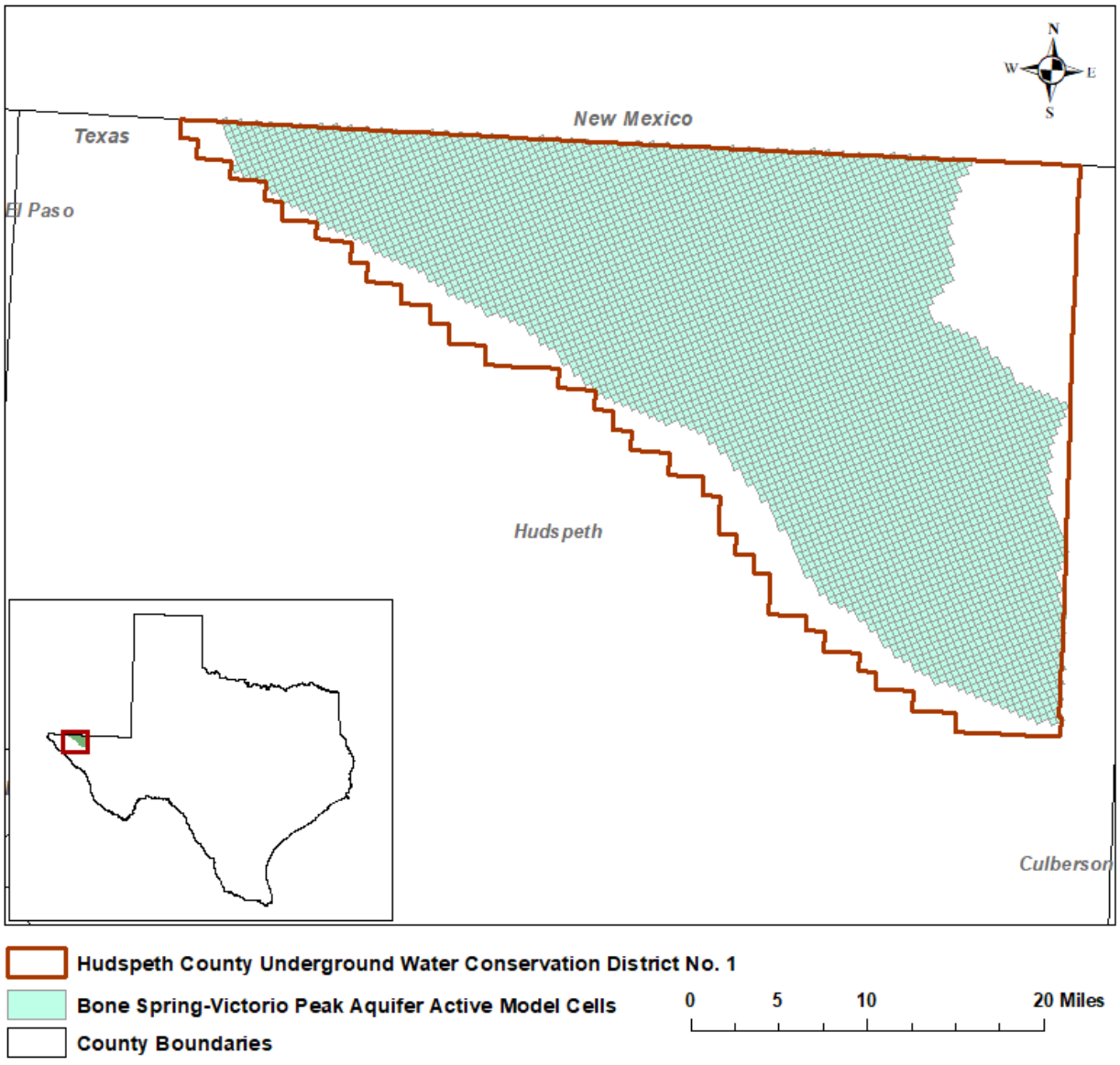
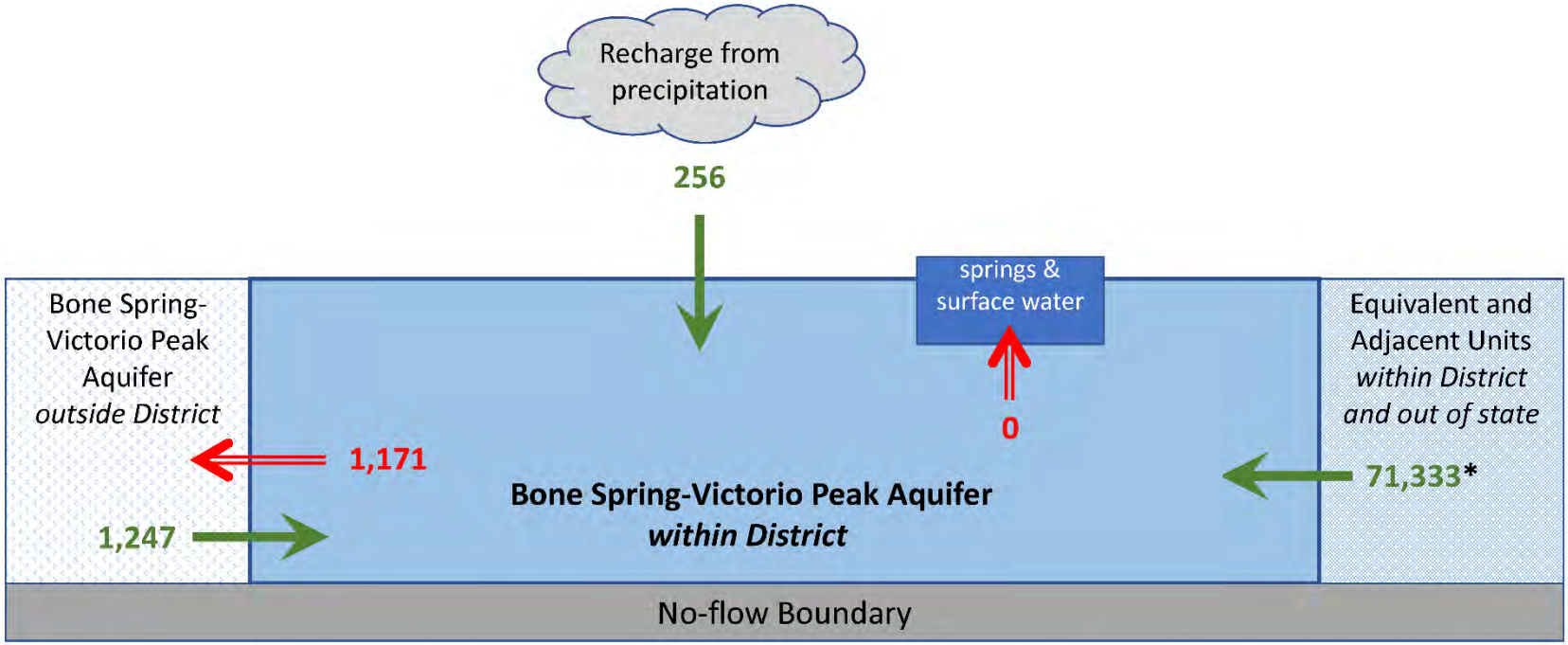


Figure 1: Area of the Bone Spring-Victorio Peak Aquifer groundwater availability model from which the information in Table 1 was extracted (the Bone Spring-Victorio Peak Aquifer extent within the district boundary).



* Flow from Equivalent and Adjacent units within District and out of state includes net inflows of 58,157 acre-feet per year from New Mexico and 13,176 acre-feet per year from within the District.

Caveat: This diagram only includes the water budget items provided in Table 1. A complete water budget would include additional inflows and outflows. For a full groundwater budget, please submit a request in writing to the Groundwater Modeling Department.

Figure 2: Generalized diagram of the summarized budget information from Table 1, representing directions of flow for the Bone Spring-Victorio Peak Aquifer within Hudspeth County Underground Water Conservation District No. 1. Flow values are expressed in acre-feet per year.

LIMITATIONS:

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

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

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.
Because the application of the groundwater models was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

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

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Texas Water Code § 36.1071