Refugio Groundwater Conservation District

Management Plan

Refugio Groundwater Conservation District Board Management Plan Adoption:	April 15, 2019
Texas Water Development Board Administrative Approval of Management Plan:	

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DISTRICT MISSION

The mission of the Refugio Groundwater Conservation District (DISTRICT) is to develop sound water conservation and management strategies designed to conserve, preserve, protect, and prevent waste of groundwater resources for long-term sustainability within Refugio County for the benefit of Refugio County's landowners, citizens, economy, and environment.

The DISTRICT will implement these strategies through the acquisition and dissemination of hydrogeological information, the development of programs and incentives to conserve and protect groundwater resources, and the adoption and enforcement of fair and appropriate District rules governing the production and use of the groundwater resources within the District.

PURPOSE OF THE MANAGEMENT PLAN

Senate Bill 1, enacted by the 75th Texas Legislature in 1997, and Senate Bill 2, enacted by the 77th Texas Legislature in 2001, established a comprehensive statewide water resource planning process and the actions necessary for groundwater conservation districts to manage and conserve the groundwater resources of the state of Texas. These bills required all groundwater conservation districts to develop a management plan which defines the groundwater needs and groundwater supplies within each district and the goals each district has set to achieve its mission.

In addition, the 79th Texas Legislature enacted House Bill 1763 in 2005 that requires joint planning among districts that are in the same groundwater management area. These districts must jointly agree upon and establish the desired future conditions of the aquifers within their respective groundwater management areas. Through this process, the groundwater conservation districts will submit the desired future conditions to the executive administrator of the Texas Water Development Board who, in turn, will provide each district within the groundwater management area with the amount of modeled available groundwater within each district. The modeled available groundwater will be based on the desired future conditions jointly established for each aquifer within the groundwater management area.

Technical information, such as the desired future conditions within the District's jurisdiction and the amount of modeled available groundwater from such aquifers is required by statute to be included in the DISTRICT's management plan and will guide the DISTRICT's regulatory and management policies. This management plan is intended to satisfy the requirements of Senate Bill 1, Senate Bill 2, House Bill 1763, the statutory requirements of Chapter 36 of the Texas Water Code, and the rules and requirements of the Texas Water Development Board.

DISTRICT INFORMATION

Creation

The DISTRICT was created by Senate Bill 1911, 76th Legislature and continued by House Bill 2046, 77th Legislature, and codified as Chapter 8854, Special District Local Laws Code. The citizens of Refugio County through a confirmation election held on November 6, 2001, ratified the DISTRICT. The boundaries of the District are conterminous with those of Refugio County, Texas. The DISTRICT was formed to protect, conserve, and prevent waste of the groundwater resources beneath the area of Refugio County. To manage the groundwater resources under its jurisdiction, the DISTRICT is charged with the rights and responsibilities specified in its enabling legislation; the provisions of Chapter 36 of the Texas Water Code; this Management Plan, and the District Rules.

Directors

The Refugio Groundwater Conservation District Board of Directors consists of five members. These five directors are elected by the voters of Refugio County and serve a four-year term. The DISTRICT observes the same four precincts as the Refugio County Commissioners' with one at-large position. Director terms are staggered on a two-year election interval in even numbered years.

Authority

The DISTRICT has the rights and responsibilities provided in Chapter 36 of the Texas Water Code and Chapter 356 of Title 31 of the Texas Administrative Code. The DISTRICT has the authority to undertake hydrogeological studies, adopt a management plan, provide for the permitting of certain water wells, and implement programs to achieve statutory requirements. The DISTRICT has rule-making authority to implement its policies and procedures to manage the groundwater resources of Refugio County.

Location and Extent

The boundaries of the DISTRICT are the same as Refugio County. This area encompasses approximately 770 square miles. The District is bounded by Victoria County, Calhoun County, Aransas County, San Patricio County, Bee County, and Goliad County.

GROUNDWATER RESOURCES OF REFUGIO COUNTY

Deposition from sediment-laden rivers, currents from the Gulf of Mexico, and storm waves have influenced the geologic formations in Refugio County. The fluctuation of the coastline over geologic eons contributed to the deposition of sediments within the Refugio County as well. The geologic formations in the Refugio County according to their depositional age are summarized in Table 1. The Gulf Coast Aquifer underlies Refugio County.

Table 1: Geologic Formations in Refugio County (after Baker, 1979, pg 8)

Era	Period	Epoch	Stratigraphic Unit	Hydrogeologic Unit
Cenozoic	Quaternary	Holocene/Pleistocene	Alluvium Beaumont/Lissie	Chicot
		Pliocene	Willis	
	Tertiary	Miocene	Upper Goliad	Evangeline
			Lower Goliad	
			Upper Lagarto	Burkeville Confining Unit
			Lower Lagarto	Jasper
			Oakville	

The Gulf Coast aquifer is conceptualized to comprise of four distinct aquifers: Chicot, Evangeline, Burkeville confining unit and the Jasper aquifer (Baker, 1979). These aquifers are included within the Central Gulf Coast Groundwater Availability Model developed by the Texas Water Development Board (Chowdhury and Mace, 2004). The Chicot and the Evangeline aquifers are used the most within the Refugio Groundwater Conservation District. The Chicot aquifer outcrops across the entire county while the Evangeline formation is under confined conditions. The thickness of the Chicot aquifer ranges from about 150 feet in the western portion of Refugio County to nearly 1,000 feet in the eastern portion of Refugio County. The thickness of the Evangeline aquifer varies from approximately 1,000 feet in the western portion of Refugio County to over 1,500 feet in the eastern portion of Refugio County. The Chicot and Evangeline aquifer consist of interbedded sands, silts and clays. The sand content is higher in the Evangeline aquifer compared to the Chicot aquifer. The water quality in the aquifer generally deteriorates along the coast.

STATEMENT OF GUIDING PRINCIPLES

The DISTRICT recognizes that the groundwater resources of Refugio County and the region are of vital importance to the many users who are dependent on these valuable resources. In addition, the DISTRICT recognizes that the landowners have an ownership right in the groundwater resources associated with their properties and are the primary stewards of the groundwater resources associated with their properties. The District will work with interested parties, especially landowners, in Refugio County to conserve, preserve, protect, and prevent waste of this most valuable resource, for the benefit of the landowners, the public, the local economy, and the environment.

The DISTRICT's management plan is intended to serve as a tool to focus the thoughts and actions of those given the responsibility for the execution of the DISTRICT's activities as well as to provide information to the staff of the DISTRICT, landowners, and others responsible for the execution of, or compliance with, the DISTRICT's policies and rules. The DISTRICT will carry out its programs and responsibilities in implementing this management plan in a prudent and cost effective manner. The DISTRICT, with public input, will adopt and enforce rules necessary to implement this management plan.

CRITERIA FOR PLAN APPROVAL

Planning Horizon

The time period for this plan is 10 years from the date of approval by the Texas Water Development Board. This plan will be reviewed within five years as required by §36.1072(e) of the Texas Water Code. The DISTRICT will consider the necessity to amend the plan and re-adopt this management plan with or without amendments as required by §36.1072(e) of the Texas Water Code.

This management plan will remain in effect until replaced by a revised management plan approved by the Texas Water Development Board.

Notice and Hearing Related to Plan Adoption - TWC §36.1071(a)

Public notices documenting that this plan was considered and adopted following appropriate public hearings are included in Appendix D.

Coordination with Regional Surface Water Management Entities - TWC §36.1071(a)

Letters transmitting this plan to the surface water management entities of the Refugio County region for coordination purposes are included in Appendix E.

Refugio Groundwater Conservation District Board of Director Resolution Adopting Management Plan

A copy of the DISTRICT's resolution adopting this plan is included in Appendix F.

ESTIMATES OF TECHNICAL INFORMATION REQUIRED BY §36.1071 OF THE TEXAS WATER CODE AND RULE 356.52 OF TITLE 31 OF THE TEXAS ADMINISTRATIVE CODE

Estimate of Modeled Available Groundwater in the DISTRICT based on Desired Future Conditions – TWC §36.1071(e)(3)(A) and 31 TAC 356.52(a)(5)(A)

Modeled available groundwater is defined in §36.001 of the Texas Water Code as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108." Desired future condition is defined in §36.001 of the Texas Water Code as "a quantitative description, adopted in accordance with §36.108 of the Texas Water Code, of the desired condition of the groundwater resources in a management area at one or more specified future times." The desired future condition of an aquifer may only be determined through joint planning with other groundwater conservation districts in the same groundwater management area as required by the 79th Legislature with the passage of House Bill 1763 into law.

The DISTRICT is located in Groundwater Management Area 15. The groundwater conservation districts of Groundwater Management Area 15 completed the first-round of joint planning process to determine the desired future condition of the aquifers within the groundwater management area.

District representatives of Groundwater Management Area 15 adopted, by resolution, the desired future condition for Gulf Coast Aquifer within Groundwater Management Area 15 on April 29, 2016. The administrator of Groundwater Management Area 15 submitted the adopted desired future conditions and explanatory report for Groundwater Management Area 15 on June 23, 2016 to Texas Water Development Board. The Texas Water Development Board designated the Groundwater Management Area 15 Explanatory Report administratively complete on October 20, 2016. The Texas Water Development Board provided the Modeled Available Groundwater estimates for Groundwater Management Area 15 to district representatives on March 22, 2017.

The desired future condition for the entire area is stated as follows:
"Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 13 feet in December 2069 from estimated year 2000 conditions."

The desired future condition for Refugio County is stated as follows:

"Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 5 feet in December 2069 from estimated year 2000 conditions."

The Texas Water Development Board reported the modeled available groundwater for Groundwater Management Area 15 based on the desired future condition in GAM Run 16-025 MAG which is incorporated into this management plan as Appendix C. The

modeled available groundwater, in acre-feet per year (AFY), of the Gulf Coast Aquifer within the DISTRICT per Table 1 of the GAM Run 16-025 MAG report is as follows:

Year					
2020	2030	2040	2050	2060	2069
5,847 AFY	5,847 AFY	5,847 AFY	5,847 AFY	5,847 AFY	5,847 AFY

Estimate of amount of groundwater being used within the district on an annual basis – TWC §36.1071(e)(3)(B) and 31 TAC 356.52(a)(5)(B)

Please refer to Appendix A.

Estimate of annual amount of recharge from precipitation to the groundwater resources within the district – TWC §36.1071(e)(3)(C) and 31 TAC 356.52(a)(5)(C)

Please refer to Appendix B.

Estimate for each aquifer, annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers – TWC §36.1071(e)(3)(D) and 31 TAC 356.52(a)(5)(D)

Please refer to Appendix B.

Estimate of annual volume of flow into and out of the district within each aquifer and between aquifers in the district – TWC §36.1071(e)(3)(E) and 31 TAC 356.52(a)(5)(E)

Please refer to Appendix B.

Estimate of projected surface water supply in the district according to the most recently adopted state water plan – TWC §36.1071(e)(3)(F) and 31 TAC 356.52(a)(5)(F)

Please refer to Appendix A.

Estimate of projected total demand for water in the district according to the most recently adopted state water plan – TWC §36.1071(e)(3)(G) and 31 TAC 356.52(a)(5)(G)

Please refer to Appendix A.

CONSIDER THE WATER SUPPLY NEEDS AND WATER MANAGEMENT STRATEGIES INCLUDED IN THE ADOPTED STATE WATER PLAN – TWC §36.1071(e)(4)

Please refer to Appendix A.

DETAILS ON THE DISTRICT MANAGEMENT OF GROUNDWATER

The Texas Legislature established that groundwater conservation districts are the preferred method of groundwater management in TWC §36.0015. The DISTRICT will manage the use of groundwater within Refugio County in order to protect, preserve, conserve, and prevent waste of the resource while seeking to maintain the economic viability of all resource user groups, public and private. The DISTRICT seeks to manage the groundwater resources of Refugio County as practicably as possible as established in the plan. In consideration of the economic and cultural activities occurring within Refugio County, the DISTRICT will identify and engage in such activities and practices, that if implemented may result in the reasonable and effective protection, preservation, conservation, waste prevention of groundwater in Refugio County. The DISTRICT will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code and the provisions of the DISTRICT's enabling legislation.

For the purposes of this management plan, the following definitions are used:

- Protection of groundwater is the activity and practice of seeking to prevent harm or injury to a groundwater resource.
- Preservation of groundwater is the activity and practice of seeking to extend the useful longevity or life of a groundwater resource.
- Conservation of groundwater is the activity and practice of seeking to use a groundwater resource in a manner that appropriately balances the impacts associated with consuming the resource and preserving the resource for the future.
- Waste prevention of groundwater is the activity and practices seeking to prevent the use of groundwater in any manner defined as waste in Section 36.001 of the Texas Water Code.

An observation well network will be established and maintained by the DISTRICT in order to monitor changing water levels and water quality of groundwater supplies within Refugio County. When a monitoring well network has been established, the DISTRICT will make a regular assessment of water supply and groundwater storage conditions, water quality conditions and will report those conditions to the Refugio Groundwater Conservation Board of Directors and to the public. The DISTRICT may undertake, as necessary, investigations of the groundwater resources within Refugio County and will make the results of investigations available to the public. The DISTRICT will co-operate with investigations of the groundwater resources of Refugio County undertaken by other local political subdivisions or agencies of the State of Texas.

In order to better manage groundwater resources the DISTRICT may establish management zones for; and adopt different rules for:

1. Each aquifer, subdivision of an aquifer, or geologic strata located in whole or in part within Refugio County; or
2. Each geographic area overlying an aquifer or subdivision of an aquifer located in whole or in part within Refugio County.

For the purpose of managing the use of groundwater within Refugio County, the DISTRICT may define sustainable use as the use of an amount of groundwater in Refugio County as a whole or any management zone established by the DISTRICT that does not exceed any of the following conditions:

1. The long-term average historical groundwater production from aquifers in Refugio County established by the DISTRICT prior to the establishment of the desired future condition of aquifers in a groundwater management area in which the DISTRICT is located; or
2. The desired future conditions of aquifers in Refugio County established by a groundwater management area in which the DISTRICT is located; or
3. The amount of modeled available groundwater resulting from the establishment of a desired future aquifer condition by the DISTRICT or a groundwater management area in which the DISTRICT is located; or
4. The estimated long-term average historical amount of annual recharge of the aquifer or aquifer subdivision in which the use occurs as recognized by the DISTRICT; or
5. Any other criteria established by the DISTRICT as being a threshold of use beyond which further use of the aquifer or aquifer subdivision may result in a specified undesirable or injurious condition.

The DISTRICT may adopt rules that protect historic use of groundwater in Refugio County to the maximum extent practical and consistent with this plan and the goals and objectives set forth herein. The DISTRICT may impose more restrictive conditions on non-historic-use permits and non-historic-use permit amendments to increase use by historic users if the limitations:

1. Apply to all non-historic-use permits and non-historic-use permit amendments to increase use by historic users, regardless of the type or location of use;
2. Bear a reasonable relationship to the DISTRICT's management plan; and
3. Are reasonably necessary to protect historic use.

The DISTRICT may adopt rules to regulate groundwater withdrawals by means of spacing and/or production limits. The relevant factors to be considered in making a determination to grant or deny a permit or limit groundwater withdrawals shall include those set forth in the DISTRICT enabling Legislation, Chapter 36 of the Texas Water Code, and the rules of the District. The District may employ technical resources at its disposal, as needed, to evaluate the groundwater resources available within Refugio County and to determine the effectiveness of regulatory or conservation measures. In consideration of particular individual, localized or District-wide conditions, including without limitation climatic conditions, the DISTRICT may, by rule, allow an increase or impose a decrease in the total production in a management zone above or below the sustainable amount for a period of time considered necessary by the DISTRICT in order to accomplish the purposes set forth in Chapter 36 of the Texas Water Code, or the DISTRICT's enabling legislation. The exercise of said discretion by the Refugio Groundwater Conservation District Board of Directors shall not be construed as limiting the power of the Refugio Groundwater Conservation District Board of Directors.

ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION – TWC §36.1071(e)(2)

The DISTRICT will implement the provisions of this plan and will utilize the provisions of this plan as a guidepost for determining the direction or priority for all DISTRICT activities. All operations of the DISTRICT, all agreements entered into by the DISTRICT, and any additional planning efforts in which the DISTRICT may participate will be consistent with the provisions of this plan.

Rules adopted by the DISTRICT for the permitting of wells and the use of groundwater shall comply with Chapter 36 of the Texas Water Code, including §36.113 of the Texas Water Code, and the provisions of this management plan. All rules will be adhered to and enforced. The promulgation and enforcement of the rules will be based on the best technical evidence available to the DISTRICT.

The DISTRICT's rules are available at the following website addresses:
www.rgcd.org or www.refugiogcd.org.

METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS – 31TAC 356.52(a)(4)

The staff of the DISTRICT will prepare and present an annual report to the Refugio Groundwater Conservation Board of Directors regarding the DISTRICT's performance in achieving management goals and objectives for the fiscal year. The report will be presented within 120 days following the completion of the DISTRICT's fiscal year. The DISTRICT will maintain the report on file for public inspection at the District's offices upon adoption at a meeting of the Refugio Groundwater Conservation Board of Directors.

GOALS, MANAGEMENT OBJECTIVES and PERFORMANCE STANDARDS

Providing the most efficient use of groundwater – TWC §36.1071(a)(1) and 31 TAC 356.52(a)(1)(A)

Objective: Develop and maintain a water well registration program for tracking well information for wells within Refugio County.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the changes related to water well registration including the number of non-grandfathered and grandfathered wells registered.

Objective: Develop and maintain a water well permitting program for processing and tracking all permits authorizing groundwater production.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the changes related to water well permitting including the number of new applications and the disposition of the applications.

Controlling and preventing waste of groundwater – TWC §36.1071(a)(2) and 31 TAC 356.52(a)(1)(B)

Objective: Develop and maintain a water well inspection program for non-exempt wells.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the findings of the inspection activities including information regarding the number of wells that require improvement to control or prevent waste of groundwater.

Controlling and preventing subsidence – TWC §36.1071(a)(3) and 31 TAC 356.52(a)(1)(C)

This category of management goal is not applicable to the DISTRICT at this time because no significant subsidence has occurred in Refugio County. The DISTRICT will monitor geological conditions for evidence of subsidence, particularly in high groundwater production areas near the coast and take appropriate action should subsidence develop.

Addressing conjunctive surface water management issues – TWC §36.1071(a)(4) and 31 TAC 356.52(a)(1)(D)

Objective: Participate in the regional water planning process by attending at least one South Central Texas Regional Water Planning Group (Region L) meeting per year.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the representatives of the DISTRICT, dates, and the number of meetings of the South Central Texas Regional Water Planning Group attended.

Addressing natural resource issues which impact the use and availability of groundwater, and which are impacted by the use of groundwater – TWC §36.1071(a)(5) and 31 TAC §356.52(a)(1)(E)

Objective: Develop and maintain a water quality monitoring program.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the monitoring activities including the number of wells monitored and the year-to-year change of water quality.

Addressing drought conditions – TWC §36.1071(a)(6) and 31 TAC 356.52(a)(1)(F)

Objective: Collect and review drought condition information related to Refugio County and the surrounding region of Texas.

Performance Standard: Each year, the District will summarize within the annual report the drought condition information collected and reviewed.

Addressing conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective – TWC §36.1071(a)(7) and 31 TAC 356.52(a)(1)(G)

Objective: Promote conservation, rainwater harvesting or brush control within Refugio County.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the activities directly related to conservation, rainwater harvesting or brush control including participation in scientific investigations and studies, educational materials developed and delivered to local schools, cooperative educational contributions and grants, public speaking events and presentations, community event participation, and educational publications.

Recharge enhancement and precipitation enhancement are deemed to be

not appropriate or cost-effective programs for the DISTRICT at this time because there are no existing recharge enhancement or precipitation enhancement programs operating in nearby counties in which the DISTRICT could participate and share costs. The costs of operating a single-county recharge enhancement or precipitation enhancement program are prohibitive and would require the DISTRICT to increase taxes. Therefore, these goals are not applicable to the DISTRICT at this time.

Addressing the desired future conditions adopted by the district under Section 36.108 – TWC §36.1071(a)(8) and 31 TAC 356.52(a)(1)(H)

Objective: Develop and maintain a water level monitoring program.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the water level monitoring activities including the number of wells monitored and the year-to-year change of water level.

Objective: Analyze water level monitoring information to evaluate water level trends and determine the degree to which the DISTRICT is complying with the desired future conditions of Gulf Coast Aquifer in Refugio County.

Performance Standard: Each year, the DISTRICT will summarize within the annual report the water level trends and the conclusions regarding the DISTRICT's compliance with the desired future condition of the Gulf Coast Aquifer in Refugio County.

List of Appendices

Appendix A. Estimated Historical Water Use and 2017 State Water Plan Datasets provided by Texas Water Development Board

Appendix B. Groundwater Availability Model Run 13-008 provided by Texas Water Development Board

Appendix C. Groundwater Availability Model Run 16-025 MAG

Appendix D. Public Notices Regarding Hearings Related to Plan Adoption

Appendix E. Letters Coordinating with Regional Surface Water Management Entities

Appendix F. Refugio Groundwater Conservation District Board of Director Resolution Adopting Management Plan

Appendix G. Minutes of Refugio Groundwater Conservation District Board of Director Meeting related to the public hearings for and adoption of the Management Plan

Appendix H. Refugio Groundwater Conservation District Contact Information

Appendix A. Estimated Historical Water Use and 2017 State Water Plan Datasets provided by Texas Water Development Board

Estimated Historical Water Use And 2017 State Water Plan Datasets:

Refugio Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
March 18, 2019

GROUNDWATER MANAGEMENT PLAN DATA:

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

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

The five reports included in this part are:

1. Estimated Historical Water Use (checklist item 2)

   from the TWDB Historical Water Use Survey (WUS)

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

   from the 2017 Texas State Water Plan (SWP)

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

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2017 SWP data available as of 3/18/2019. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2017 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

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

The 2017 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

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

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

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2017. TWDB staff anticipates the calculation and posting of these estimates at a later date.

REFUGIO COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2016	GW	1,030	0	0	0	827	391	2,248
	SW	0	0	0	0	0	43	43
2015	GW	901	0	0	0	489	376	1,766
	SW	0	0	0	0	0	42	42
2014	GW	1,204	0	0	0	575	365	2,144
	SW	0	0	0	0	0	41	41
2013	GW	1,254	0	0	0	936	349	2,539
	SW	0	0	0	0	0	39	39
2012	GW	1,312	0	0	0	908	428	2,648
	SW	0	0	0	0	0	47	47
2011	GW	1,339	0	30	0	2,189	490	4,048
	SW	0	0	3	0	0	55	58
2010	GW	1,137	0	42	0	561	504	2,244
	SW	0	0	4	0	0	56	60
2009	GW	1,232	0	53	0	156	565	2,006
	SW	0	0	5	0	0	63	68
2008	GW	1,106	0	62	0	1,164	536	2,868
	SW	0	0	7	0	0	60	67
2007	GW	1,094	0	0	0	439	502	2,035
	SW	0	0	0	0	0	55	55
2006	GW	1,112	0	0	0	911	592	2,615
	SW	0	0	0	0	0	66	66
2005	GW	1,108	0	0	0	588	668	2,364
	SW	0	0	0	0	0	74	74
2004	GW	1,036	0	0	0	527	62	1,625
	SW	0	0	0	0	0	600	600
2003	GW	1,014	0	0	0	621	60	1,695
	SW	0	0	0	0	0	585	585
2002	GW	1,116	0	0	0	1,019	63	2,198
	SW	0	0	0	0	0	613	613
2001	GW	1,138	0	0	0	850	55	2,043
	SW	0	0	0	0	0	535	535

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

REFUGIO COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
L	LIVESTOCK, REFUGIO	SAN ANTONIO	SAN ANTONIO LIVESTOCK LOCAL SUPPLY	16	16	16	16	16	16
L	LIVESTOCK, REFUGIO	SAN ANTONIO-NUECES	SAN ANTONIO-NUECES LIVESTOCK LOCAL SUPPLY	302	302	302	302	302	302
	Sum of Projected Surface Water Supplies (acre-feet)			**318**	**318**	**318**	**318**	**318**	**318**

Projected Water Demands
TWDB 2017 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.

REFUGIO COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	COUNTY-OTHER, REFUGIO	SAN ANTONIO	11	11	10	10	8	8
L	COUNTY-OTHER, REFUGIO	SAN ANTONIO-NUECES	507	501	488	490	351	352
L	IRRIGATION, REFUGIO	SAN ANTONIO-NUECES	652	652	652	652	652	652
L	LIVESTOCK, REFUGIO	SAN ANTONIO	32	32	32	32	32	32
L	LIVESTOCK, REFUGIO	SAN ANTONIO-NUECES	604	604	604	604	604	604
L	MINING, REFUGIO	SAN ANTONIO	3	3	3	2	1	1
L	MINING, REFUGIO	SAN ANTONIO-NUECES	63	66	48	36	23	14
L	REFUGIO	SAN ANTONIO-NUECES	803	808	797	805	578	580
L	WOODSBORO	SAN ANTONIO-NUECES	361	361	354	360	258	259
	Sum of Projected Water Demands (acre-feet)		**3,036**	**3,038**	**2,988**	**2,991**	**2,507**	**2,502**

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

REFUGIO COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
L	COUNTY-OTHER, REFUGIO	SAN ANTONIO	1	1	2	2	4	4
L	COUNTY-OTHER, REFUGIO	SAN ANTONIO-NUECES	4	10	23	21	160	159
L	IRRIGATION, REFUGIO	SAN ANTONIO-NUECES	0	0	0	0	0	0
L	LIVESTOCK, REFUGIO	SAN ANTONIO	0	0	0	0	0	0
L	LIVESTOCK, REFUGIO	SAN ANTONIO-NUECES	0	0	0	0	0	0
L	MINING, REFUGIO	SAN ANTONIO	0	0	0	0	0	0
L	MINING, REFUGIO	SAN ANTONIO-NUECES	0	0	0	0	0	0
L	REFUGIO	SAN ANTONIO-NUECES	431	426	437	429	656	654
L	WOODSBORO	SAN ANTONIO-NUECES	245	245	252	246	348	347
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**0**	**0**	**0**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

REFUGIO COUNTY

WUG, Basin (RWPG)

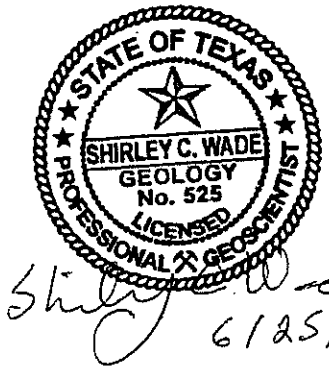
All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
COUNTY-OTHER, REFUGIO, SAN ANTONIO (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [REFUGIO]	1	0	0	0	0	0
		1	**0**	**0**	**0**	**0**	**0**
COUNTY-OTHER, REFUGIO, SAN ANTONIO-NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [REFUGIO]	57	5	0	0	0	0
		57	**5**	**0**	**0**	**0**	**0**
REFUGIO, SAN ANTONIO-NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [REFUGIO]	157	147	112	69	109	120
		157	**147**	**112**	**69**	**109**	**120**
WOODSBORO, SAN ANTONIO-NUECES (L)							
MUNICIPAL WATER CONSERVATION (RURAL)	DEMAND REDUCTION [REFUGIO]	68	43	6	0	20	26
		68	**43**	**6**	**0**	**20**	**26**
Sum of Projected Water Management Strategies (acre-feet)		**283**	**195**	**118**	**69**	**129**	**146**

Appendix B. Groundwater Availability Model Run 13-008 provided by Texas Water Development Board

GAM RUN 13-008: REFUGIO GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
June 25, 2013



The seal appearing on this document was authorized by Shirley Wade, P.G. 525, on June 25, 2013.

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GAM RUN 13-008: REFUGIO GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 936-0883
June 25, 2013

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (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. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
- for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

This report—Part 2 of a two-part package of information from the TWDB to Refugio Groundwater Conservation District management—fulfills the requirements noted above. Part 1 of the 2-part package is the Historical Water Use/State Water Plan data report. The District should have received, or will receive, this data report from the TWDB Groundwater Technical Assistance Section. Questions about the data report can be directed to Mr. Stephen Allen, Stephen.Allen@twdb.texas.gov, (512) 463-7317. The groundwater management plan for the Refugio Groundwater Conservation District should be adopted by the district on or before December 25, 2013 and submitted to the executive administrator of the TWDB on or before January 24, 2014. The current management plan for the Refugio Groundwater Conservation District expires on March 25, 2014.

This report discusses the method, assumptions, and results from model runs using the groundwater availability model for the central portion of the Gulf Coast Aquifer. This model run replaces the results of GAM Run 08-39. GAM Run 13-008 meets current standards set after the release of GAM Run 08-39. Table 1 summarizes the groundwater availability model data required by the statute, and Figure 1 shows the area of the model from which the values in the table was extracted. If after reviewing the figure, Refugio Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the Texas Water Development Board immediately. The TWDB has also approved, for planning purposes, alternative models that can have water budget information extracted for the district. These alternative models include the Groundwater Management Area 16 alternative model and the fully penetrating alternative model for the central portion of the Gulf Coast Aquifer. Please contact the author of this report if a comparison report using either of these models is desired.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model for the central portion of the Gulf Coast Aquifer was run for this analysis. Refugio Groundwater Conservation District Water budgets for 1981 through 1999 were extracted 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, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portions of the aquifers located within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Gulf Coast Aquifer

- Version 1.01 of the groundwater availability model for the central portion of the Gulf Coast Aquifer was used for this analysis. See Chowdhury and others (2004) and Waterstone and others (2003) for assumptions and limitations of the groundwater availability model.

- The model for the central section of the Gulf Coast Aquifer assumes partially penetrating wells in the Evangeline Aquifer due to a lack of data for aquifer properties in the lower section of the aquifer.

- This groundwater availability model includes four layers, which generally correspond to (from top to bottom):

1. the Chicot Aquifer,
2. the Evangeline Aquifer,
3. the Burkeville Confining Unit, and
4. the Jasper Aquifer including parts of the Catahoula Formation.

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the aquifers located within the district and averaged over the duration of the calibration and verification portion of the model runs in the district, as shown in Table 1. The components of the modified budget shown in Table 1 include:

- 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.
- Surface water outflow—The total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).
- Flow into and out of district—The lateral flow within the aquifer between the district and adjacent counties.
- Flow between aquifers—The net vertical flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. "Inflow" to an aquifer from an overlying or underlying aquifer will always equal the "Outflow" from the other aquifer.

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

TABLE 1: SUMMARIZED INFORMATION FOR THE GULF COAST AQUIFER THAT IS NEEDED FOR REFUGIO GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT. THESE FLOWS MAY INCLUDE BRACKISH WATERS.

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Gulf Coast Aquifer	13,072
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Gulf Coast Aquifer	40,891[1)]
Estimated annual volume of flow into the district within each aquifer in the district	Gulf Coast Aquifer	19,159
Estimated annual volume of flow out of the district within each aquifer in the district	Gulf Coast Aquifer	15,103
Estimated net annual volume of flow between each aquifer in the district	Not Applicable	Not Applicable

[1)] discharge amount includes 5,020 acre-feet per year of water leaving the district to bays.

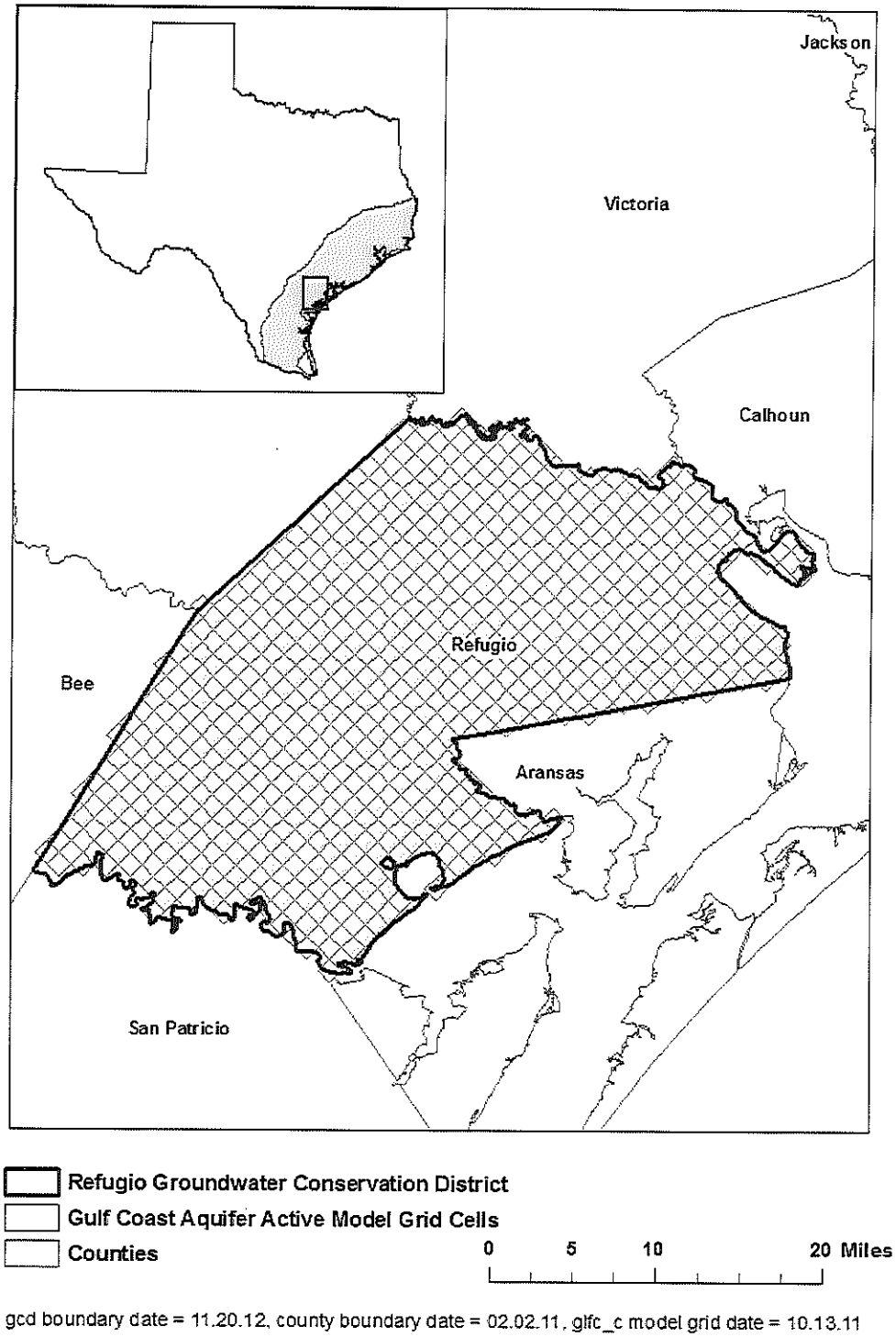

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE GULF COAST AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE GULF COAST AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS

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

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

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

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

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

REFERENCES:

Chowdhury, Ali. H., Wade, S., Mace, R.E., and Ridgeway, C., 2004, Groundwater Availability Model of the Central Gulf Coast Aquifer System: Numerical Simulations through 1999- Model Report, 114 p., http://www.twdb.texas.gov/groundwater/models/gam/glfc_c/TWDB_Recalibration_Report.pdf.

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

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

Ridgeway, Cynthia K., 2008, GAM Run 08-39: Texas Water Development Board, GAM Run 08-39 Report, 4 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR08-39.pdf.

Waterstone Environmental Hydrology and Engineering Inc. and Parsons, 2003, Groundwater availability of the Central Gulf Coast Aquifer: Numerical Simulations to 2050, Central Gulf Coast, Texas Contract report to the Texas Water Development Board, 157 p.

Appendix C. Groundwater Availability Model Run 16-025 MAG

GAM RUN 16-025 MAG:
MODELED AVAILABLE GROUNDWATER FOR THE GULF COAST AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 15

Rohit Raj Goswami, Ph.D., P.E.
Texas Water Development Board
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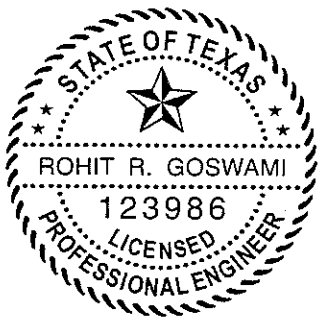
(512) 463-0495
March 22, 2017



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GAM RUN 16-025 MAG: MODELED AVAILABLE GROUNDWATER FOR THE GULF COAST AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 15

Rohit Raj Goswami, Ph.D., P.E.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Section
(512) 463-0495
March 22, 2017

EXECUTIVE SUMMARY:

The modeled available groundwater for Groundwater Management Area 15 for the Gulf Coast Aquifer System is summarized by decade for the groundwater conservation districts (Table 1) and for use in the regional water planning process (Table 2). The modeled available groundwater estimates range from approximately 515,000 acre-feet per year in 2020 to approximately 518,000 acre-feet per year in 2069(Table 1). The estimates were extracted from results of a model run using the groundwater availability model for the central part of the Gulf Coast Aquifer System (version 1.01). The model run files, which meet the desired future conditions adopted by district representatives of Groundwater Management Area 15, were submitted to the Texas Water Development Board (TWDB) on June 28, 2016, as part of the Desired Future Conditions Explanatory Report for Groundwater Management Area 15. The explanatory report and other materials submitted to the Texas Water Development Board (TWDB) were determined to be administratively complete on October 20, 2016.

REQUESTOR:

Mr. Tim Andruss, chair of Groundwater Management Area 15.

DESCRIPTION OF REQUEST:

In a letter dated June 23, 2016, Mr. Tim Andruss provided the TWDB with the desired future conditions of the Gulf Coast Aquifer System adopted by the groundwater conservation districts in Groundwater Management Area 15. The Gulf Coast Aquifer System includes the Chicot Aquifer, Evangeline Aquifer, Burkeville Confining Unit and the Jasper Aquifer (including parts of the Catahoula Formation). TWDB staff worked with INTERA Incorporated, the consultant for Groundwater Management Area 15, in reviewing

model files associated with the desired future conditions. We received clarification from INTERA Incorporated, on behalf of Groundwater Management Area 15, on September 18, 2016, concerning assumptions on variances of average drawdown values per county to model results, which was ±3.5 feet for nearly all areas within the Groundwater Management Area 15. The exception is Goliad County which has a variance in drawdown of ±5 feet. The desired future conditions for the Gulf Coast Aquifer System, as described in Resolution No. 2016-01 and adopted April 29, 2016, by the groundwater conservation districts within Groundwater Management Area 15, are described below:

Groundwater Management Area 15 [all counties]

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 13 feet in December 2069 from estimated year 2000 conditions.

Aransas County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 0 feet in December 2069 from estimated year 2000 conditions.

Bee County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 7 feet in December 2069 from estimated year 2000 conditions.

Calhoun County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 5 feet in December 2069 from estimated year 2000 conditions.

Colorado County

Drawdown shall not exceed an average of 17 feet in Chicot and Evangeline Aquifers and 23 feet in in the Jasper Aquifer in December 2069 from estimated year 2000 conditions.

DeWitt County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 17 feet in December 2069 from estimated year 2000 conditions.

Fayette County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 16 feet in December 2069 from estimated year 2000 conditions.

Goliad County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 10 feet in December 2069 from estimated year 2000 conditions.

Jackson County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 15 feet in December 2069 from estimated year 2000 conditions.

Karnes County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 22 feet in December 2069 from estimated year 2000 conditions.

Lavaca County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 18 feet in December 2069 from estimated year 2000 conditions.

Matagorda County

Drawdown shall not exceed an average of 11 feet in Chicot and Evangeline Aquifers in December 2069 from estimated year 2000 conditions.

Refugio County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 5 feet in December 2069 from estimated year 2000 conditions.

Victoria County

Drawdown of the Gulf Coast Aquifer System shall not exceed an average of 5 feet in December 2069 from estimated year 2000 conditions.

Wharton County

Drawdown shall not exceed an average of 15 feet in Chicot and Evangeline Aquifers in December 2069 from estimated year 2000 conditions.

Based on the adopted desired future conditions, TWDB has estimated the modeled available groundwater for the Gulf Coast Aquifer System in Groundwater Management Area 15.

METHODS:

The groundwater availability model for the central part of the Gulf Coast Aquifer System (Figure 1) was run using the model files submitted with the explanatory report (GMA 15 and others, 2016). Model-calculated water levels were extracted for the year 2000 and the end of the year 2069, and drawdown was calculated as the difference between water levels at the beginning of 2000 and water levels at the end of 2069. Drawdown averages were calculated for each county by aquifer and for the entire Groundwater Management Area 15 by aquifer. As specified in the explanatory report (GMA 15 and others, 2016), drawdown for cells which became dry during the simulation (water level dropped below the base of the cell) were excluded from the averaging. The calculated drawdown averages were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions within one foot.

The modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates are presented by county and groundwater conservation district, subtotaled by groundwater conservation district, and then summed by Groundwater Management Area 15 (Figure 2 and Table 1). Annual pumping rates are also presented by county, river basin, and regional water planning area within Groundwater Management Area 15 (Figure 2 and Table 2).

Modeled Available Groundwater and Permitting

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

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the groundwater availability are described below:

- Version 1.01 of the groundwater availability model for the central portion of the Gulf Coast Aquifer System was used for this analysis. See Chowdhury and others (2004) and Waterstone and others (2003) for assumptions and limitations of the model.

- The model has four layers which represent the Chicot Aquifer (Layer 1), the Evangeline Aquifer (Layer 2), the Burkeville Confining Unit (Layer 3), and the Jasper Aquifer and parts of the Catahoula Formation in direct hydrologic communication with the Jasper Aquifer (Layer 4).

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

- Drawdown averages and modeled available groundwater values are based on the extent of the model area rather than official aquifer boundaries (Figures 1 and 2).

- Drawdown for cells with water levels below the base elevation of the cell ("dry" cells) were excluded from the averaging per emails exchanged with INTERA, Inc. dated October 21, 2015.

- Estimates of modeled available groundwater from the model simulation were rounded to whole numbers.

- A model drawdown tolerance of up to 5 feet was assumed for Goliad County and up to 3.5 feet for the rest of Groundwater Management Area 15 when comparing desired future conditions (average drawdown values per county) to model drawdown results.

- Average drawdown by county may include some model cells that represent portions of surface water such as bays, reservoirs, and the Gulf of Mexico.

RESULTS:

The modeled available groundwater for the Gulf Coast Aquifer System that achieves the desired future conditions adopted by Groundwater Management Area 15 increases from approximately 515,000 acre-feet per year in 2020 to approximately 518,000 acre-feet per year in 2069 (Table 1). The modeled available groundwater is summarized by groundwater conservation district and county (Table 1). The modeled available groundwater has also been summarized by county, river basin, and regional water planning area for use in the regional water planning process (Table 2). Small differences of values between table summaries are due to rounding.

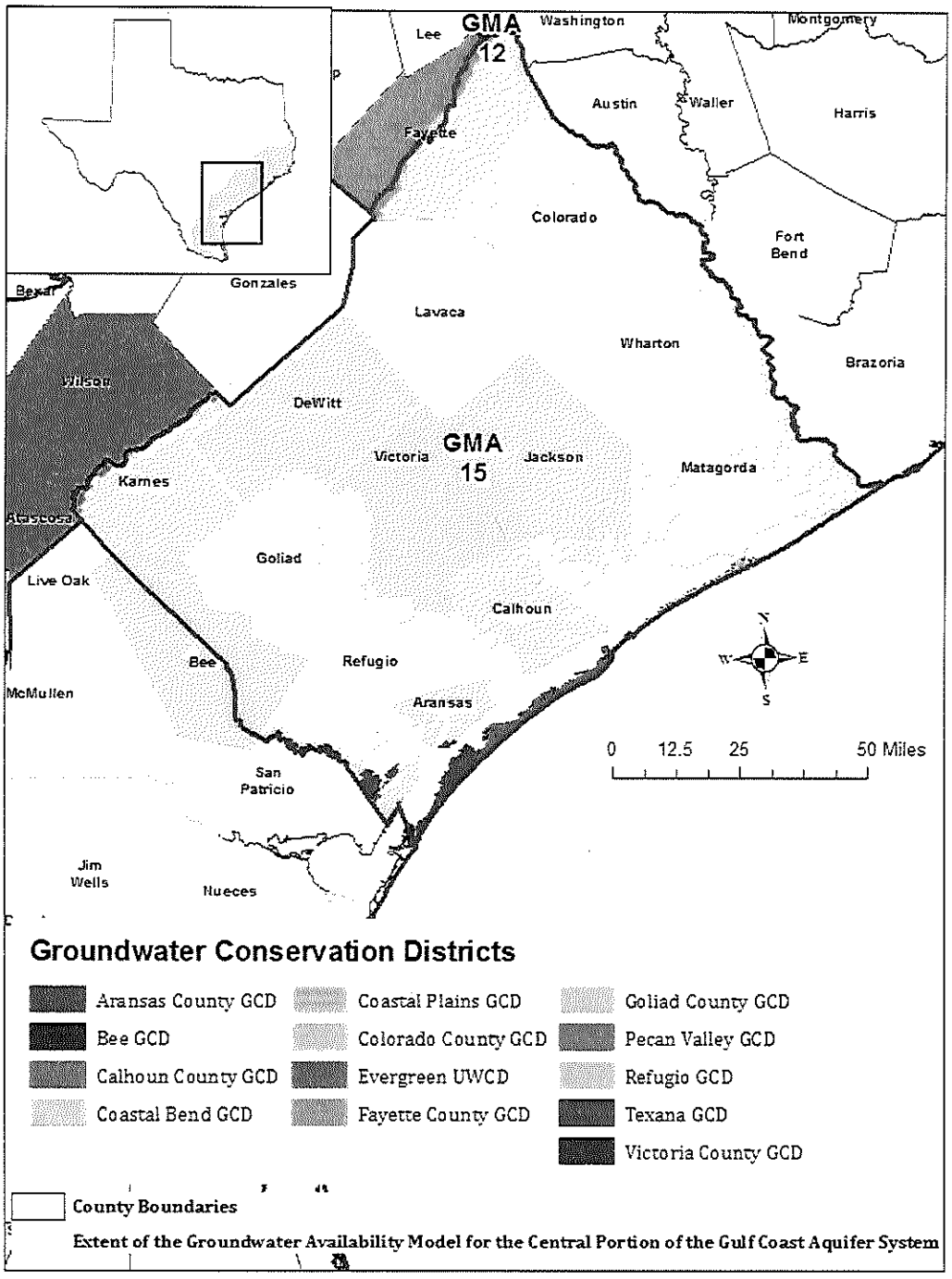

FIGURE 1. MAP SHOWING GROUNDWATER CONSERVATION DISTRICTS (GCDS) AND COUNTIES IN GROUNDWATER MANAGEMENT AREA 15 OVERLAIN ON THE EXTENT OF THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE GULF COAST AQUIFER SYSTEM.

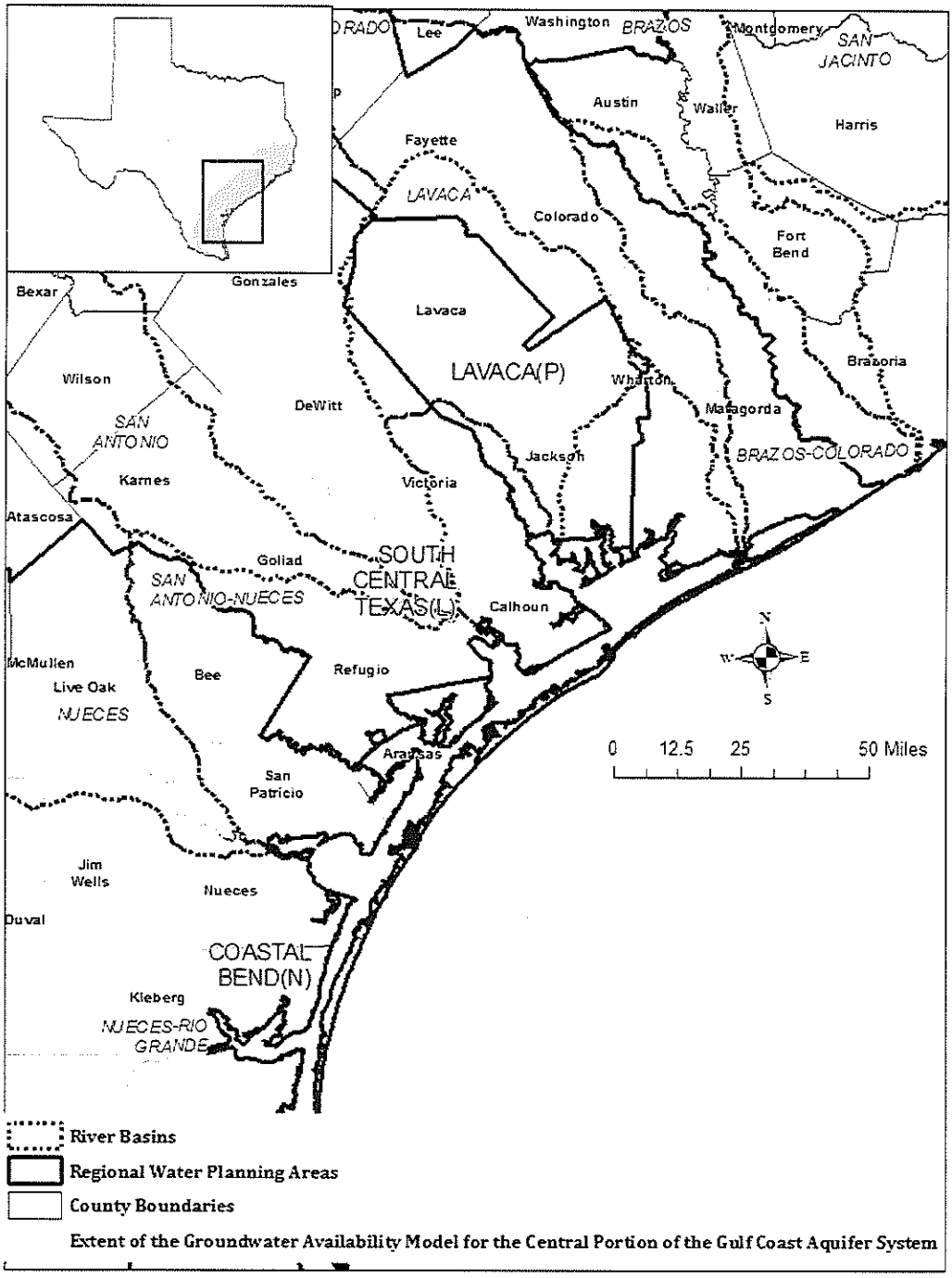

FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS (GCDS), COUNTIES, AND RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 15 OVERLAIN ON THE EXTENT OF THE GROUNDWATER AVAILABILITY MODEL FOR THE CENTRAL PORTION OF THE GULF COAST AQUIFER SYSTEM.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE GULF COAST AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 15 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2069. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Aransas County GCD Total	**Aransas**	**Gulf Coast Aquifer System**	**1,542**	**1,542**	**1,542**	**1,542**	**1,542**	**1,542**	**1,542**
Bee County GCD Total	**Bee**	**Gulf Coast Aquifer System**	**9,456**	**9,456**	**9,431**	**9,431**	**9,379**	**9,379**	**9,361**
Calhoun County GCD Total	**Calhoun**	**Gulf Coast Aquifer System**	**2,569**	**7,565**	**7,565**	**7,565**	**7,565**	**7,565**	**7,565**
Coastal Bend GCD Total	**Wharton**	**Gulf Coast Aquifer System (Chicot and Evangeline)**	**181,168**	**181,168**	**181,168**	**181,168**	**181,168**	**181,168**	**181,168**
Coastal Plains GCD Total	**Matagorda**	**Gulf Coast Aquifer System (Chicot and Evangeline)**	**38,828**	**38,828**	**38,828**	**38,828**	**38,828**	**38,828**	**38,828**
Colorado County GCD	Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	79,780	74,964	74,964	72,765	72,765	71,618	71,618
Colorado County GCD	Colorado	Gulf Coast Aquifer System (Jasper)	918	918	918	918	918	918	918
Colorado County GCD Total	**Colorado**	**Gulf Coast Aquifer System**	**80,698**	**75,882**	**75,882**	**73,683**	**73,683**	**72,536**	**72,536**
Evergreen UWCD Total	**Karnes**	**Gulf Coast Aquifer System**	**10,196**	**10,196**	**10,196**	**3,015**	**2,917**	**2,751**	**2,751**
Fayette County GCD Total	**Fayette**	**Gulf Coast Aquifer System**	**1,977**	**1,853**	**1,853**	**1,853**	**1,853**	**1,853**	**1,703**
Goliad County GCD Total	**Goliad**	**Gulf Coast Aquifer System**	**11,420**	**11,539**	**11,539**	**11,539**	**11,539**	**11,552**	**11,539**

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060	2069
Pecan Valley GCD Total	**DeWitt**	**Gulf Coast Aquifer System**	**15,471**	**15,476**	**15,476**	**14,485**	**14,485**	**14,485**	**14,485**
Refugio GCD Total	**Refugio**	**Gulf Coast Aquifer System**	**5,847**	**5,847**	**5,847**	**5,847**	**5,847**	**5,847**	**5,847**
Texana GCD Total	**Jackson**	**Gulf Coast Aquifer System**	**76,787**	**90,482**	**90,482**	**90,482**	**90,482**	**90,482**	**90,482**
Victoria County GCD Total	**Victoria**	**Gulf Coast Aquifer System**	**35,640**	**44,974**	**49,970**	**54,966**	**54,966**	**59,963**	**59,963**
Total (GCDs)		**Gulf Coast Aquifer System**	**471,599**	**494,808**	**499,779**	**494,404**	**494,254**	**497,951**	**497,770**
No District-County	Bee	Gulf Coast Aquifer System	10	10	10	10	10	10	10
No District-County	Lavaca	Gulf Coast Aquifer System	20,253	20,253	20,253	20,253	20,253	20,253	20,239
No district-County Total		**Gulf Coast Aquifer System**	**20,263**	**20,263**	**20,263**	**20,263**	**20,263**	**20,263**	**20,249**
Total for GMA 15		**Gulf Coast Aquifer System**	**491,862**	**515,071**	**520,042**	**514,667**	**514,517**	**518,214**	**518,019**

TABLE 2 **MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE GULF COAST AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 15. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), RIVER BASIN, AND AQUIFER.**

County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060
Aransas	N	San Antonio- Nueces	Gulf Coast Aquifer System	1,542	1,542	1,542	1,542	1,542
Bee	N	San Antonio- Nueces	Gulf Coast Aquifer System	9,439	9,414	9,414	9,362	9,362
Bee	N	Nueces	Gulf Coast Aquifer System	27	27	27	27	27
Calhoun	L	Colorado- Lavaca	Gulf Coast Aquifer System	5,210	5,210	5,210	5,210	5,210
Calhoun	L	Guadalupe	Gulf Coast Aquifer System	18	18	18	18	18
Calhoun	L	Lavaca-Guadalupe	Gulf Coast Aquifer System	2,330	2,330	2,330	2,330	2,330
Calhoun	L	San Antonio- Nueces	Gulf Coast Aquifer System	7	7	7	7	7
Colorado	K	Brazos-Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	15,342	15,342	15,342	15,342	15,342
Colorado	K	Brazos-Colorado	Gulf Coast Aquifer System (Jasper Aquifer)	49	49	49	49	49
Colorado	K	Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	20,506	20,506	20,066	20,066	20,066
Colorado	K	Colorado	Gulf Coast Aquifer System (Jasper Aquifer)	273	273	273	273	273
Colorado	K	Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	39,116	39,116	37,357	37,357	36,210
Colorado	K	Lavaca	Gulf Coast Aquifer System (Jasper Aquifer)	596	596	596	596	596
Dewitt	L	Guadalupe	Gulf Coast Aquifer System	11,358	11,358	10,470	10,470	10,470
Dewitt	L	Lavaca-Guadalupe	Gulf Coast Aquifer System	417	417	417	417	417
Dewitt	L	Lavaca	Gulf Coast Aquifer System	2,935	2,935	2,935	2,874	2,874
Dewitt	L	San Antonio	Gulf Coast Aquifer System	766	766	724	724	724

County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060
Fayette	K	Brazos	Gulf Coast Aquifer System	2	2	2	2	2
Fayette	K	Colorado	Gulf Coast Aquifer System	989	989	989	989	989
Fayette	K	Lavaca	Gulf Coast Aquifer System	862	862	862	862	862
Goliad	L	Guadalupe	Gulf Coast Aquifer System	4,377	4,377	4,377	4,377	4,380
Goliad	L	San Antonio- Nueces	Gulf Coast Aquifer System	1,190	1,190	1,190	1,190	1,195
Goliad	L	San Antonio	Gulf Coast Aquifer System	5,972	5,972	5,972	5,972	5,977
Jackson	P	Colorado-Lavaca	Gulf Coast Aquifer System	28,025	28,025	28,025	28,025	28,025
Jackson	P	Lavaca-Guadalupe	Gulf Coast Aquifer System	12,875	12,875	12,875	12,875	12,875
Jackson	P	Lavaca	Gulf Coast Aquifer System	49,582	49,582	49,582	49,582	49,582
Karnes	L	Guadalupe	Gulf Coast Aquifer System	11	11	11	11	11
Karnes	L	Nueces	Gulf Coast Aquifer System	1,057	1,057	78	78	78
Karnes	L	San Antonio	Gulf Coast Aquifer System	9,082	9,082	2,880	2,782	2,616
Karnes	L	San Antonio-Nueces	Gulf Coast Aquifer System	46	46	46	46	46
Lavaca	P	Guadalupe	Gulf Coast Aquifer System	41	41	41	41	41
Lavaca	P	Lavaca-Guadalupe	Gulf Coast Aquifer System	401	401	401	401	401
Lavaca	P	Lavaca	Gulf Coast Aquifer System	19,811	19,811	19,811	19,811	19,811
Matagorda	K	Brazos-Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	15,282	15,282	15,282	15,282	15,282
Matagorda	K	Colorado-Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	20,329	20,329	20,329	20,329	20,329
Matagorda	K	Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	3,217	3,217	3,217	3,217	3,217
Refugio	L	San Antonio- Nueces	Jasper Aquifer	5,526	5,526	5,526	5,526	5,526
Refugio	L	San Antonio	Gulf Coast Aquifer System	321	321	321	321	321
Victoria	L	Guadalupe	Gulf Coast Aquifer System	17,600	22,596	27,592	27,592	27,592
Victoria	L	Lavaca-Guadalupe	Gulf Coast Aquifer System	25,451	25,451	25,451	25,451	30,448
Victoria	L	Lavaca	Gulf Coast Aquifer System	234	234	234	234	234
Victoria	L	San Antonio	Gulf Coast Aquifer System	1,689	1,689	1,689	1,689	1,689

County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060
Wharton	K	Brazos-Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	50,527	50,527	50,527	50,527	50,527
Wharton	K	Colorado-Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	16,196	16,196	16,196	16,196	16,196
Wharton	P	Colorado-Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	14,091	14,091	14,091	14,091	14,091
Wharton	K	Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	35,910	35,910	35,910	35,910	35,910
Wharton	P	Colorado	Gulf Coast Aquifer System (Chicot and Evangeline)	873	873	873	873	873
Wharton	K	Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	579	579	579	579	579
Wharton	P	Lavaca	Gulf Coast Aquifer System (Chicot and Evangeline)	62,992	62,992	62,992	62,992	62,992
GMA 15 Total			**Gulf Coast Aquifer System**	**515,071**	**520,042**	**514,667**	**514,517**	**518,214**

LIMITATIONS:

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

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

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

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

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

REFERENCES:

Chowdhury, A., Wade, S., Mace, R.E., and Ridgeway, C. 2004. Groundwater Availability of the Central Gulf Coast Aquifer System: Numerical Simulations through 1999: Texas Water Development Board, unpublished report.

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

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

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

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

Waterstone Engineering, Inc., and Parsons, Inc., 2003, Groundwater Availability of the Central Gulf Coast Aquifer: Numerical Simulations to 2050, Central Gulf Coast, Texas: Contract draft report submitted to Texas Water Development Board

Appendix D. Public Notices Regarding Hearings Related to Plan Adoption

Public Hearing Notice

Pursuant to Chapter 36, Texas Water Code, the Refugio Groundwater Conservation District will conduct a public hearing on the Management Plan of the District with proposed revisions at 6:00 P.M. on April 15, 2019, at 808 Commerce St., Refugio, TX 78377. The hearing will be conducted to receive comments and suggestions from the public concerning the proposed management plan.

The Management Plan of the District with proposed revisions was developed using the best available data and addresses the following management goals, as applicable: (1) providing the most efficient use of groundwater: (2) controlling and preventing waste of groundwater; (3) controlling and preventing subsidence; (4) addressing conjunctive surface water management issues; (5) addressing natural resource issues; (6) addressing drought conditions; (7) addressing conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective; and (8) addressing the desired future conditions adopted by the district under Section 36.108.

The Management Plan of the District with proposed revisions (1) identifies the performance standards and management objectives under which the district will operate to achieve the management goals ; (2) specifies the actions, procedures, performance, and avoidance that are or may be necessary to effect the plan; (3) includes estimates of (A) modeled available groundwater in the district based on the desired future condition established under Section 36.108; (B) the amount of groundwater being used within the district on an annual basis; (C) the annual amount of recharge from precipitation, if any, to the groundwater resources within the district; (D) for each aquifer, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; (E) the annual volume of flow into and out of the district within each aquifer and between aquifers in the district, if a groundwater availability model is available; (F) the projected surface water supply in the district according to the most recently adopted state water plan; and (G) the projected total demand for water in the district according to the most recently adopted state water plan; and (4) considers the water supply needs and water management strategies included in the adopted state water plan.

A copy of the Management Plan of the District with proposed revisions may be reviewed or copied at the District's office located at 604 Commerce St., Refugio, TX 78377. The Management Plan of the District with proposed revisions is available on the District's website at www.rgcd.org. Questions or comments should be directed to Billie S. Dunnivan, General Manager at Refugio Groundwater Conservation District, 604 Commerce St., Refugio, Texas 78377 or admin@rgcd.org or (361) 526-1483.

Certificate of Posting

The above Notice of Meeting was posted March 26, 2019, at a place convenient to the public on a bulletin board in the Refugio County Courthouse at Refugio, Texas.

WITNESS MY HAND AND SEAL of office on above date.

Ida Ramirez, Clerk County Court
Refugio County, Texas

By: Margie A. Castellano Deputy
Margie A. Castellano

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361.358.2550 office@mysoutex.com

AFFIDAVIT of PUBLICATION

THE STATE OF TEXAS

COUNTY OF BEE

Before me, the undersigned authority, on this day personally appeared George G. Latcham, known to me, who, by me duly sworn, on his oath deposes and says that he is the Publisher of the Advance-Guard Press, having general circulation in Refugio County, who being by me duly sworn, deposes and says that the foregoing attached notice was published in said newspaper on the following date(s), to wit:
March 28, 2019

George G. Latcham, Publisher

Sworn to and subscribed before me by George G. Latcham,
this the 28 day of March 2019 AD
to certify which witness my hand and official seal.

Mary Virginia Massey

Mary Virginia Massey,
Notary Public in and for the State of Texas

MARY VIRGINIA MASSEY
NOTARY PUBLIC
STATE OF TEXAS
ID#129190677
My Comm. Expires 11-02-2020

Legals 0910

Public Hearing Notice

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The Management Plan of the District with proposed revisions (1) identifies the performance standards and management objectives under which the district will operate to achieve the management goals; (2) specifies the actions, procedures, performance, and avoidance that are or may be necessary to effect the plan; (3) includes estimates of (A) modeled available groundwater in the district based on the desired future condition established under Section 36.108; (B) the amount of groundwater being used within the district on an annual basis; (C) the annual amount of recharge from precipitation, if any, to the groundwater resources within the district; (D) for each aquifer, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; (E) the annual volume of flow into and out of the district within each aquifer and between aquifers in the district, if a groundwater availability model is available; (F) the projected surface water supply in the district according to the most recently adopted state water plan; and (G) the projected total demand for water in the district according to the most recently adopted state water plan; and (4) considers the water supply needs and water management strategies included in the adopted state water plan.

A copy of the Management Plan of the District with proposed revisions may be reviewed or copied at the District's office located at 604 Commerce St., Refugio, TX 78377. The Management Plan of the District with proposed revisions is available on the District's website at *www.rgcd.org*. Questions or comments should be directed to Sillie B. Dunnivan, General Manager at Refugio Groundwater Conservation District, 604 Commerce St., Refugio, Texas 78377 or *admin@rgcd.org* or (361) 526-1483.

TO3-28

Appendix E. Letters Coordinating with Regional Surface Water Management Entities

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 | Fax (361) 526-1294 | WWW.RGCD.ORG

April 18, 2019

Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

Via: Certified Mail RRR no: 7007 1490 0000 4656 4069

RE: Refugio Groundwater Conservation District Management Plan

Dear Texas Water Development Board,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 I Fax (361) 526-1294 I WWW.RGCD.ORG

April 18, 2019

Texana Groundwater Conservation District
Attn: Ms. Candace Whittley, General Manager
P.O. Box 1098
Edna, Texas 77957

Via: Certified Mail RRR no: 7007 1490 0000 4656 4045

RE: Refugio Groundwater Conservation District Management Plan

Dear Ms. Whittley,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billlie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 I Fax (361) 526-1294 I WWW.RGCD.ORG

April 18, 2019

San Antonio River Authority
Attn: Ms. Suzanne Scott, General Manager
100 E. Guenther St.
San Antonio, Texas 78204

Via: Certified Mail RRR no: 7007 1490 0000 4656 4052

RE: Refugio Groundwater Conservation District Management Plan

Dear Ms. Scott,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billlie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 | Fax (361) 526-1294 | WWW.RGCD.ORG

April 18, 2019

Victoria County Groundwater Conservation District
Attn: Mr. Tim Andruss, General Manager
2805 N. Navarro St., Suite 210
Victoria, Texas 77901

Via: Certified Mail RRR no: 7007 1490 0000 4656 4250

RE: Refugio Groundwater Conservation District Management Plan

Dear Mr. Andruss,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billlie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 | Fax (361) 526-1294 | WWW.RGCD.ORG

April 18, 2019

Goliad County Groundwater Conservation District
Attn: Ms. Barbara Smith
P.O. Box 562
Goliad, Texas 77963

Via: Certified Mail RRR no: 7007 1490 0000 4656 4267

RE: Refugio Groundwater Conservation District Management Plan

Dear Ms. Smith,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billlie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 I Fax (361) 526-1294 I WWW.RGCD.ORG

April 18, 2019

Calhoun County Groundwater Conservation District
Attn: Ms. Tammy Amaimo, General Manager
P.O. Box 1395
Port Lavaca, Texas 77979

Via: Certified Mail RRR no: 7007 1490 0000 4656 4274

RE: Refugio Groundwater Conservation District Management Plan

Dear Ms. Amaimo,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billie S. Dunnivan

Billlie S. Dunnivan
General Manager

Refugio Groundwater Conservation District

604 Commerce St., P.O. Box 116, Refugio, TX 78377
Phone (361) 526-1483/4803 I Fax (361) 526-1294 I WWW.RGCD.ORG

April 18, 2019

Bee Groundwater Conservation District
Attn: Mr. Lonnie Stewart, General Manager
P.O. Box 682
Beeville, Texas 78104-0682

Via: Certified Mail RRR no: 7007 1490 0000 4656 4181

RE: Refugio Groundwater Conservation District Management Plan

Dear Mr. Stewart,

Please find enclosed a copy of the approved District Management Plan for the Refugio Groundwater Conservation District. Pursuant to Chapter 36, Water Code, the District has sent a copy to the Texas Water Development Board for review and approval.

If you have any questions, please contact the District.

Sincerely,

Billlie S. Dunnivan
General Manager

Appendix F. Refugio Groundwater Conservation District Board of Director Resolution Adopting Management Plan

RESOLUTION

Resolution Number: 2019-04-15-A

Resolution Adopting the Refugio Groundwater Conservation District Management Plan

WHEREAS on March 28, 2019, a Notice of Hearing was published in the Advance-Guard Press newspaper regarding a public hearing on the adoption of the Refugio Groundwater Conservation District Management Plan; and

WHEREAS on April 15, 2019, the Refugio Groundwater Conservation District Board of Directors with a quorum being present, conducted a public hearing regarding the adoption of the Refugio Groundwater Conservation District Management Plan; and

WHEREAS The Refugio Groundwater Conservation District Management Plan had been developed in coordination with surface water management entities and other interested parties;

NOW THEREFORE BE IT RESOLVED that the 2019 Refugio Groundwater Conservation District Management Plan is ADOPTED as described in the Refugio Groundwater Conservation District Management Plan attached hereto and made a part hereof for all purposes and that said management plan shall be submitted by the General Manager to the Executive Administrator of the Texas Water Development Board for review and approval with all necessary documentation.

Adopted by a vote of 3 ayes and 0 nays on this 15 day of April, 2019.

Director, Refugio Groundwater Conservation District

I, undersigned, do hereby certify that the above resolution was adopted by the Board of Directors of the Refugio Groundwater Conservation District on the 15 day of April, 2019.

Director, Refugio Groundwater Conservation District

Appendix G. Minutes of Refugio Groundwater Conservation District Board of Director Meeting related to the public hearings for and adoption of the Management Plan

REFUGIO GROUNDWATER CONSERVATION DISTRICT
Meeting Minutes for April 15, 2019

The Refugio Groundwater Conservation District Board of Directors' Meeting convened at the Refugio County Courthouse, 808 Commerce St., Refugio, Texas 78377 on Monday, April 15, 2019 at 6:00 PM.

The following representatives of the Refugio Groundwater Conservation District attended the meeting:

Precinct 1:	Mr. Larry Aduddell, President	Present
Precinct 2:	Mr. Carroll Borden, Secretary	Absent
Precinct 3:	Dr. Gary Wright, Vice President	Absent
Precinct 4:	Mr. Fredric Biery, Director	Present
At Large:	Mr. Scott Carter	Present
General Manager:	Mr. Billie Sue Dunnivan	Present
Legal Counsel:	Mr. James Allison	Absent
Consultant:	Mr. Tim Andruss	Present

Agenda Item 1: Call the meeting to order and welcome guests.

Discussion: Mr. Aduddell called the meeting to order at 6:00 PM.

Board Action: None.

Agenda Item 2: Receive public comments.

Discussion: None.

Board Action: No action taken.

Agenda Item 3: Consideration of and possible action on matters related to Groundwater Management including the permitting efforts and activities of the District.

Discussion: Ms. Dunnivan provided three exempt use permits were approved and issued since the last meeting.

Board Action: No action taken.

Agenda Item 4: Consideration of and possible action on matters related to Groundwater Protection including complaints, investigations, violations and enforcement related to disposal and injection wells, contamination and waste, and permitting.

Discussion: None.

Board Action: No action taken.

Agenda Item 5: Consideration of and possible action on matters related to Groundwater Monitoring.

Discussion: None.

Board Action: No action taken.

Agenda Item 6: Consideration of and possible action on matters related to Groundwater Conservation.

Discussion: None.

Board Action: No action taken.

Agenda Item 7: Consideration of and possible action on matters related to Groundwater Resource Planning including Groundwater Management Area 15 Joint Planning and regional water planning.

Discussion: Mr. Andruss provided GMA 15 met on April 11, 2019.

Board Action: No action taken.

Agenda Item 8: Consideration of and possible action on matters related to Groundwater Policy including the Management Plan of the District and the Rules of the District.

Discussion: Ms. Dunnivan explained the District in accordance with the requirement established in Chapter 36 of the Texas Water Code, published necessary notice of the public hearing. The proposed Adoption of the Management Plan has been available for review by the public. The District has not received public input regarding the Adoption of the Management Plan.

Board Action: At 6:09 PM, Mr. Biery motioned to open the public hearing to receive public input on the proposed Adoption of the Management Plan.

There was no public input.

At 6:10 PM, Mr. Carter motioned to close the public hearing to receive public input concerning the proposed Adoption of Management Plan and close the associated record.

Mr. Biery moved to accept and approve the proposed Adoption of the Management Plan as drafted and approve Resolution Number: 2019-04-15-A. Mr. Carter seconded the motion. The motion passed with the following:

Precinct 1:	Mr. Larry Aduddell, President	AYE
Precinct 2:	Mr. Carroll Borden, Secretary	ABSENT
Precinct 3:	Dr. Gary Wright, Vice President	ABSENT
Precinct 4:	Mr. Fredric Biery, Director	AYE
At Large:	Mr. Scott Carter	AYE

Agenda Item 9: Consideration of and possible action on matters related to Groundwater Research.

Discussion: None.

Board Action: No action taken.

Agenda Item 10: Consideration of and possible action on matters related to Program and Project Management.

Discussion: None.

Board Action: No action taken.

Agenda Item 11: Consideration of and possible action on matters related to Performance Management including management goals and objectives of the District.

Discussion: None.

Board Action: No action taken.

Agenda Item 12: Consideration of and possible action on matters related to Meeting Management including minutes of previous meetings.

Discussion: Ms. Dunnivan provided the draft meeting minutes held on March 18, 2019 were sent to the directors prior to the meeting.

Board Action: Mr. Biery moved to accept and approve the meeting minutes for the meeting held on March 18, 2019 as drafted. Mr. Aduddell seconded the motion. The motion passed with the following:

Precinct 1:	Mr. Larry Aduddell, President	AYE
Precinct 2:	Mr. Carroll Borden, Secretary	ABSENT
Precinct 3:	Dr. Gary Wright, Vice President	ABSENT

Precinct 4:	Mr. Fredric Biery, Director	AYE
At Large:	Mr. Scott Carter	AYE

Agenda Item 13: Consideration of and possible action on matters related to Financial Management including the annual budget of the district, audit of the district, financial reports of the district, bills and invoices of the district.

A. Annual Budget
Discussion: Ms. Dunnivan provided Mr. Charles Leshikar of Vantage Bank Texas has presented a new letter of credit and pledge agreement. Mr. Allison has reviewed the letter of credit and pledge agreement.

Board Action: Mr. Biery moved to accept the letter of credit and pledge agreement provided by Mr. Charles Leshikar of Vantage Bank Texas. Mr. Carter seconded the motion. The motion passed with the following:

Precinct 1:	Mr. Larry Aduddell, President	AYE
Precinct 2:	Mr. Carroll Borden, Secretary	ABSENT
Precinct 3:	Dr. Gary Wright, Vice President	ABSENT
Precinct 4:	Mr. Fredric Biery, Director	AYE
At Large:	Mr. Scott Carter	AYE

B. Financial Reports
Discussion: Ms. Dunnivan provided the financial reports and records for March, 2019 will be presented to the board at the next meeting.

Board Action: None.

C. Bills and Invoices
Discussion: Ms. Dunnivan provided the following lists of accounts associated with the financial records of the district.

Note Link List of Paid Accounts Payable Records created since previous meeting.
RGCD - Adm - FM - Accounts Payable - ACCTP-20190321-01 - $649.60 - Invoice #7011904A - TML Health - Status: Paid
RGCD - Adm - FM - Accounts Payable - ACCTP-20190321-02 - $198.92 - Invoice #361-526-1483-539-2 - AT&T - Status: Paid
RGCD - Adm - FM - Accounts Payable - ACCTP-20190329-01 - $1,337.76- Payroll 3/16/19 - 3/31/19 - Billie S Dunnivan - Status: Paid
RGCD - Adm - FM - Accounts Payable - ACCTP-20190401-01 - $600.00 - Rent - April 2019 - Delbert Cox - Status: Paid

Note Link List of Paid Accounts Receivable Records created since previous meeting:

RGCD - Adm - FM - Accounts Receivable - ACCTR-20190328-01 - $46.21 - AA Refund - Vantage Bank Texas - Status: Paid
RGCD - Adm - FM - Accounts Receivable - ACCTR-20190329-01 - $33.03 - Interest Earned - Vantage Bank Texas- Status: Paid
RGCD - Adm - FM - Accounts Receivable - ACCTR-20190403-01 - $2,337.40 - Tax Collections - Ida M Turner TAC- Status: Paid

Discussion: Ms. Dunnivan provided the following lists of unpaid accounts associated with the financial records of the district.

1. RGCD - Adm - FM - Accounts Payable - ACCTP-20190401-02 - $991.76 - Invoice #8757 -TML IRP - Status: UNPAID
2. RGCD - Adm - FM - Accounts Payable - ACCTP-20190401-03 - $174.00 - Ad #00223884 - Beeville Publishing Co., Inc. - Status: UNPAID
3. RGCD - Adm - FM - Accounts Payable - ACCTP-20190403-01 - $20.63 - Invoice #01127018 - Office Systems - Status: UNPAID
4. RGCD - Adm - FM - Accounts Payable - ACCTP-20190411-01 - $49.88 - Invoice #2019-2363 - Billie S Dunnivan - Status: UNPAID
5. RGCD - Adm - FM - Accounts Payable - ACCTP-20190412-01- $2,816.77 - Invoice #ILA-201904-R - VCGCD - Status: UNPAID
6. RGCD - Adm - FM - Accounts Payable - ACCTP-20190412-02 - $900.00 - Invoice #ILA-20190411-R - VCGCD - Status: UNPAID
7. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-02 - $1,337.77 - Payroll 4/1/19 - 4/15/19 - Billie S Dunnivan - Status: UNPAID
8. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-03 - $42.02 - Invoice #122491469 - AT&T - Status: UNPAID
9. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-04 - $74.62 - Invoice #0416 - Card Service Center - Status: UNPAID

Board Action: Mr. Carter motioned to pay the following bills and invoices.

1. RGCD - Adm - FM - Accounts Payable - ACCTP-20190401-02 - $991.76 - Invoice #8757 -TML IRP - Status: UNPAID
2. RGCD - Adm - FM - Accounts Payable - ACCTP-20190401-03 - $174.00 - Ad #00223884 - Beeville Publishing Co., Inc. - Status: UNPAID
3. RGCD - Adm - FM - Accounts Payable - ACCTP-20190403-01 - $20.63 - Invoice #01127018 - Office Systems - Status: UNPAID
4. RGCD - Adm - FM - Accounts Payable - ACCTP-20190411-01 - $49.88 - Invoice #2019-2363 - Billie S Dunnivan - Status: UNPAID
5. RGCD - Adm - FM - Accounts Payable - ACCTP-20190412-01- $2,816.77 - Invoice #ILA-201904-R - VCGCD - Status: UNPAID
6. RGCD - Adm - FM - Accounts Payable - ACCTP-20190412-02 - $900.00 - Invoice #ILA-20190411-R - VCGCD - Status: UNPAID
7. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-02 - $1,337.77 - Payroll 4/1/19 - 4/15/19 - Billie S Dunnivan - Status: UNPAID

8. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-03 - $42.02 - Invoice #122491469 - AT&T - Status: UNPAID
9. RGCD - Adm - FM - Accounts Payable - ACCTP-20190415-04 - $74.62 - Invoice #0416 - Card Service Center - Status: UNPAID

Mr. Biery seconded the motion. The motion passed with the following:

Precinct 1:	Mr. Larry Aduddell, President	AYE
Precinct 2:	Mr. Carroll Borden, Secretary	ABSENT
Precinct 3:	Dr. Gary Wright, Vice President	ABSENT
Precinct 4:	Mr. Fredric Biery, Director	AYE
At Large:	Mr. Scott Carter	AYE

Agenda Item 14: Consideration of and possible action on matters related to office management including personnel and staffing.

Discussion: Ms. Dunnivan submitted her letter of resignation and retirement effective May 31, 2019.

Board Action: No action taken.

Agenda Item 15: Consideration of and possible action on matters related to legal counsel report.

Discussion: None.

Board Action: No action taken.

Agenda Item 16: Adjourn.

Discussion: Mr. Biery motioned to adjourn at 6:45 PM. Mr. Carter seconded the motion. The motion passed with the following:

Precinct 1:	Mr. Larry Aduddell, President	AYE
Precinct 2:	Mr. Carroll Borden, Secretary	ABSENT
Precinct 3:	Dr. Gary Wright, Vice President	ABSENT
Precinct 4:	Mr. Fredric Biery, Director	AYE
At Large:	Mr. Scott Carter	AYE

Prepared by:

Billie Sue Dunnivan
General Manager
Refugio Groundwater Conservation District

The above and foregoing minutes were read and approved on this the _____ day of _____, 20____.

ATTEST:

_____ _____

Director Director

Appendix H. Refugio Groundwater Conservation District Contact Information

District Contact Information

Physical Address:
604 Commerce Street
Refugio, Texas 78377

Mailing Address:
Refugio Groundwater Conservation District
P.O. Box 116
Refugio, Texas 78377

Email Address:
admin@rgcd.org

Phone Number:
361-526-1483

FAX Number:
361-526-1294

Board of Directors:
Larry Aduddell, Precinct 1
Carroll Borden, Precinct 2
Dr. Gary Wright, Precinct 3
Fredric Biery, Precinct 4
Scott Carter, At Large

Staff:
Billie S. Dunnivan, General Manager