GATEWAY GROUNDWATER CONSERVATION DISTRICT

MANAGEMENT PLAN

DISTRICT MISSION

The mission of the Gateway Groundwater Conservation District is to manage, protect, and conserve the groundwater resources of the District for the citizens, economy, and environment of the District; while protecting personal property rights, and promoting the constructive and beneficial uses of the available groundwater in the District.

STATEMENT OF GUIDING PRINCIPLES

The District recognizes the vital importance of groundwater resources in the region. The District is committed to the following principles, which we believe will maximize the benefits of these water resources for the citizens of the District. The goals of the Management Plan are consistent with those of the Region A, Region B, and the Region O Water Plans.

1. Citizens of the District should be benefited economically and aesthetically by the natural resources of the District.
2. These natural resources should be preserved for present and future generations.
3. A better understanding of the amount of available groundwater, the quality of the groundwater, and factors affecting the sustainable use of the groundwater will be necessary to achieve the District's mission.
4. Landowner property rights should be honored, and landowners will be partners with the District in managing and protecting groundwater resources. Groundwater resources should be managed by local interest.
5. All citizens will be treated equally, without preference or prejudice.
6. The District will coordinate with the Regional Water Planning Groups, other affected water planning groups, private or public water supply entities, and State water management agencies.
7. The District does not wish to become a tax burden on the citizens. The water resources should not be over-managed so as to become an impediment to the beneficial uses of groundwater.

GENERAL DESCRIPTION

The District was created by the Citizens of Hardeman and Foard Counties through election on February 1, 2001. The original name of the District was Tri-county Groundwater Conservation District, because the District anticipated including at least part of Wilbarger County in the future. Since that time, the citizens of Childress and Cottle Counties have elected to join the District, and the new name of Gateway Groundwater Conservation District has been adopted. Motley County joined the District after approval in an election on 3 November 2009. The District has a ten member Board of Directors, with two directors for each of the four counties. Current officers are Johnny Kajs – President, Bill Haseloff- Vice President, and Jason Poole – Secretary. Other members are H. L. Ayers, Weldon Tabor, Brent Whitaker, Bob Biddy, Todd Smith, William Luckett, and Marisue B. Potts-Powell.

The District comprises an area of 3,967 square miles, containing all of Cottle, Foard, Hardeman and Motley counties, and approximately 94% of Childress County. These counties are located in the northern low rolling plains area of Texas. Much of the area is rough rangeland not suitable for cultivated crops. Cropland production is limited by low rainfall (an average of about 23 inches annually) and low water infiltration through the heavy clay soils in large parts of the District. The District is within the Red River Watershed. The topography of the Foard and Hardeman County area consists of level to rolling plains farmland in the eastern parts of these counties to the rough, juniper covered hills of the Blaine Escarpment in western Foard and Hardeman Counties. The ground surface elevation generally slopes downward from west to east. The highest land surface elevations are in Motley County, located above the "Caprock" of the Llano Estacado plateau. There are areas of cultivation in the northwest part of Motley County, with smaller areas scattered throughout the county. Cottle, Foard and Motley Counties have the largest percentages of rough land suitable only for range land (approximately 70%), while only about 40% of Childress and Hardeman Counties is restricted to rangeland.

The economy is dominated by agriculture; primarily beef cattle, wheat and cotton production. Sport hunting has increased significantly in recent years, and has been a boost to the otherwise generally depressed agricultural economy. Land leases to power companies for possible wind energy development has been another recent source of income for landowners. A slow but steady decline in population for the counties in the District and a slight decline in irrigation water use indicates that future water use demand is unlikely to increase. However, as water shortages increase in other areas, there may be potential for District landowners to sell water outside the District.

About 75% of the groundwater use in the District is for agriculture. Compared to other groundwater districts, the groundwater use and economic impact of groundwater use in Gateway Groundwater Conservation District is small.

Gateway GCD is located within the State designated Groundwater Management Area 6. Gateway GCD coordinates with and participates in planning meetings of the Groundwater Management Area.

Gateway GCD is located within the State designated Regional Water Planning Groups A (Childress County), B (Cottle, Foard & Hardeman Counties), and O (Motley County).

GROUNDWATER RESOURCES

The District has two significant groundwater sources: first the Blaine Aquifer in the western parts of Foard County and Hardeman County & the eastern parts of Cottle County and Childress County, and second the Seymour Aquifer located in eastern Hardeman County, northeastern Foard County, central Childress County, and northern Motley County. There is a limited source of groundwater from the Ogallala & Dockum Aquifers in southwestern Motley County.

SEYMOUR AQUIFER

The geologic and hydrologic character of the Seymour Aquifer is quite variable. The Seymour Aquifer "Pods" are disconnected hydraulically from one area to another. Since it is an alluvial aquifer, porosity and continuity is quite variable. Typically, wells are 30 to 60 feet deep and are completed in the lower part of the formation, which consists of sand and gravel. Well yields average 270 gallons per minute and can be as high as 1,300 gallons per minute. Saturated thickness is typically between 20 and 40 feet.

Artificial recharge by pumping into the aquifer would probably not be an efficient way to store water in this aquifer, except in areas where the formation is fairly uniform. However, there may be effective ways to increase recharge from rainwater. Furrow diking is an experimental farming method used to increase soil infiltration into the root zone of cultivated crops. It creates small water pockets in the furrows after rainfall and reduces runoff. This method should also increase infiltration into the shallow Seymour Aquifer, especially in the lighter soils. Other methods may be building small berms to trap runoff water in shallow ponds to allow more time for infiltration. Mesquite is a costly invader in the rangelands of the District. Brush control to remove or kill mesquite will increase groundwater recharge, because the large amount of deep soil moisture taken by mesquite would be reduced.

The water quality in the Seymour aquifer is variable. The Total dissolved Solids content varies from about 50 milligrams per liter to about 300 mg/l. However, there are many wells completed in both the Seymour and the underlying Blaine aquifer. These wells may have TDS values above 2000 mg/L. Total Dissolved solids are typically lower for wells in the coarser sands of the major recharge and irrigation areas. Therefore, the dissolved solid concentrations are normally not a problem for irrigation or for public supplies. However, nitrate levels often exceed the State standard of 10 mg/l recommended for public water supplies. These high nitrate concentrations are the result of leaching of natural soil nitrogen and applied nitrogen fertilizers from the land above the Seymour Aquifer.

BLAINE AQUIFER

The Blaine Aquifer consists of water stored in cavities of gypsum and limestone rock. This aquifer is typically encountered about 100 to 150 feet below the ground surface and has a saturated thickness less than 300 feet. Recharge occurs via open cavities and infiltration.

The Blaine Aquifer water is high in total dissolved solids, typically about 3,000 mg/l, due to sulfates and chlorides. This salinity is too high for public water supply use without expensive treatment. However, it can and has been used to irrigate cotton. Local farmers report that it has been used to irrigate cotton fields since the 1950's without significant problems. The high solids results from the natural dissolving of the gypsum and limestone rock of the aquifer, therefore there are no feasible methods to reduce the dissolved solids levels.

OGALLALA AQUIFER

The Ogallala Aquifer is present in the southwest corner of Motley County. The formation thickness at the western edge of the county is approximately 100 feet. The formation thins rapidly to the east, and does not reach the North-South Texas 70 Highway. The maximum saturated thickness is about 30 feet, in the western portion. The sediments are primarily sands with silt and clay. A gravel conglomerate is often present at the base. The formation is highly eroded and the topography is not suitable for widespread irrigation activities. Water quality is generally good, Reported water production rates are generally less than 300 GPM.

DOCKUM GROUP AQUIFERS

The Dockum Aquifer underlies the Ogallala Aquifer and extends farther to the east where it is exposed on the surface. The sediments are primarily sandstones, conglomerates and sandy shales. Irrigation wells completed in the Dockum Group formations have had yields as high as 700 GPM in the past. Current yields are generally lower. Water quality is good to fair.

STATUTORILY REQUIRED TABLES

MODELED AVAILABLE GROUNDWATER - Appendix A**,** TWDB Letter, December 9, 2011, Re: Modeled available groundwater estimates for the Blaine, Dockum, Ogallala, and Seymour aquifers in GMA 6.

AMOUNT OF GROUNDWATER BEING USED – Appendix B, Estimated Historical Groundwater Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

RECHARGE FROM PRECIPITATION - Appendix C, GAM Run 14-013, April 10, 2015, Gateway Groundwater Conservation District Management Plan.

DISCHARGE FROM THE AQUIFERS TO SPRINGS, LAKES & STREAMS – Appendix C, GAM Run 14-013, April 10, 2015, Gateway Groundwater Conservation District Management Plan

FLOW INTO THE DISTRICT AQUIFERS – Appendix C, GAM Run 14-013, April 10, 2015, Gateway Groundwater Conservation District Management Plan

FLOW OUT OF THE DISTRICTAQUIFERS – Appendix C, GAM Run 14-013, April 10, 2015, Gateway Groundwater Conservation District Management Plan

FLOW BETWEEN DISTRICT AQUIFERS – Appendix C, GAM Run 14-013, April 10, 2015, Gateway Groundwater Conservation District Management Plan

PROJECTED SURFACE WATER SUPPLIES – Appendix B, Estimated Historical Groundwater Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

PROJECTED TOTAL WATER DEMAND – Appendix B, Estimated Historical Groundwater Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

PROJECTED WATER SUPPLY NEEDS - Appendix B, Estimated Historical Groundwater Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

WATER MANAGEMENT STRATEGIES - Appendix B, Estimated Historical Groundwater Use and 2012 State Water Plan Datasets, July 7, 2015, TWDB

MANAGEMENT OF GROUNDWATER SUPPLIES

This management plan has been adopted by the Board in accordance with Section 36.1071 of the Texas Water Code and will remain in effect for a period of five years unless modified by the Board prior to the end of the planning period. The District, in partnership with the landowners of the District, will manage the groundwater within the District in accordance with its mission and goals while seeking to maintain the economic viability of all resource user groups, public and private. The District will strive to identify and implement practices which will result in the sustainability of the groundwater resources within the District, including reductions of groundwater use where necessary to achieve that result.

The District will implement monitoring programs and collect any available information to increase our understanding of the groundwater resources and help determine any trends in groundwater availability and quality.

The District will have rules which may regulate groundwater withdrawals by means of production limits and fees, spacing regulations, and export fees and requirements. The District may deny a well construction permit or limit groundwater withdrawals in accordance with District rules. In making a determination to deny a permit or limit groundwater withdrawals or export, the District will weigh the public benefit against individual hardship after considering all appropriate testimony. However, the conservation and preservation of the groundwater resource is a major consideration in any such determination.

In pursuit of the District's mission of preserving and protecting the resource, the District will enforce the terms and conditions of permits and the rules of the District by enjoining the permit holder in a court of competent jurisdiction, as provided for in Texas Water Code Chapter 36.102, if necessary.

MANAGEMENT ISSUES

The total amount of water supply within the District remains greater than the projected water demands. The challenge for the District will be to protect and conserve the available water supply.

Even though the estimated sustainable use for the District is higher than the current use, conservation and avoidance of water wasteful practices will be a concern of the District.

Localized areas of high irrigation use can exceed supply, especially in the Seymour aquifer. Permeability through the Seymour alluvium is variable and groundwater flow is typically slow. Farmers report that their wells draw down during prolonged dry spells. Certain areas are more prone to well drawdown and pumping limitations than other areas nearby. There are some areas within the Seymour Aquifer that do not appear to be well connected hydraulically with other nearby areas. Proper management will be difficult in these areas. Avoidance of waste will help to maximize the sustainable benefits of the groundwater resource and will be a District goal.

Another challenge for the District will be to prevent degradation of the water quality in the aquifers. Primary concerns are

(1) Contamination of the Blaine and Seymour Aquifer water resulting from improperly plugged or capped abandoned wells, due to inflow from the surface or other water bearing strata.
(2) Increasing nitrate concentrations in the Seymour Aquifer due to leaching of nitrates from fertilizer, nitrogen fixing crops, or naturally occurring nitrogen.

Another management concern for the District is the operating expenses of the District. These aquifers have been used for many years without becoming depleted, without significant avoidable deterioration in water quality, and without serious conflicts between water users. If the District cannot provide positive benefits to the District's citizens, then we believe that we should spend a minimum of tax dollars in this effort. Litigation expenses are out of proportion to the economy and the life styles of the citizens and landowners of the District. We will not commit our citizens to these type expenses, and we are concerned that the State mandated management of these Groundwater Districts amounts to an unfunded State mandate, and we will not be an economic burden upon our own citizens.

ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

The District will implement the provisions of this plan and will utilize the provisions of this plan as guidelines 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.

The District has adopted District rules relating to the permitting of wells and the production of groundwater. The District rules shall be as required by the Water Code the provisions of this plan. All District rules will be enforced. The promulgation and enforcement of the District rules will be based on the best technical evidence available.

The District will treat all citizens equally. Citizens may apply to the District for a waiver in the enforcement of one or more of the District rules on the grounds of adverse economic effects or unique local conditions. In granting or denying any waiver to the District rules, the Board shall consider the potential for adverse effects on adjacent landowners. The exercise of discretion in granting or denying of any waiver by the Board shall not be construed as limiting the power of the Board.

In the implementation of this plan and in the management of groundwater resources within the District, the District will seek the cooperation of all residents, landowners, and well owners of the District. All activities of the District will be undertaken in cooperation and coordination with any appropriate state, regional, or local water management entity.

MANAGEMENT GOALS

The District will track the progress in achieving management goals by providing an annual report to the Board of Directors.

1. GOAL: PROVIDE THE MOST EFFICIENT USE OF GROUNDWATER.

MANAGEMENT OBJECTIVE: To encourage and help farmers in the District to convert their irrigation systems to more efficient systems by assistance through Federal cost share programs such as EQIP.

PERFORMANCE STANDARD: Post information on the District's Web Site at least once per year containing information about assistance available to farmers in the District to improve the efficiency of their irrigation systems.

MANAGEMENT OBJECTIVE: Disseminate information from the A&M University system, Texas Water Development Board, and other sources to promote the additional beneficial and economic uses of groundwater in the District.

PERFORMANCE STANDARD: Post available information on the District's Web Site concerning the additional beneficial and economic uses of groundwater.

2. GOAL: PREVENT WASTE

MANAGEMENT OBJECTIVE: Review District rules as necessary to evaluate their applicability to preventing problems such as water table drawdown, interference between wells, and degradation of water quality.

PERFORMANCE STANDARDS: Review District rules at least once per year and report to the District Board incidences of complaints and problems concerning overuse, water waste, interference between wells, water quality problems and other problems.

PERFORMANCE STANDARD: Post available information on the District's Web Site at least once per year promoting the efficient uses and avoidance of waste of groundwater.

MANAGEMENT OBJECTIVE: Enforce District rules concerning capping and plugging of abandoned wells, and other actions as necessary to protect the quality of the groundwater in the District.

PERFORMANCE STANDARD: Report to the Board on the number of complaints, reports, and actions taken concerning groundwater quality.

MANAGEMENT OBJECTIVE: Disseminate information concerning the requirements and recommended practices to prevent the contamination of groundwater.

PERFORMANCE STANDARD: Post information on the District's Web Site at least once per year concerning the prevention of contamination of groundwater.

3. GOAL: CONJUNCTIVE USE OF SURFACE WATER & GROUBDWARER.

MANAGEMENT OBJECTIVE: Support and assist efforts to implement conjunctive surface water and groundwater projects within the District, providing that such projects are consistent with District goals. (Lake Pauline may be a good possibility)

PERFORMANCE STANDARD: Attend at least one meeting per year of the Red River Water Authority of Texas and the Greenbelt Municipal and Industrial Water Authority.

4. GOAL: NATURAL RESOURCE ISSUES.

MANAGEMENT OBJECTIVE: Assist wildlife and conservation groups, by providing groundwater use estimates and other District information that may be useful in determining the effects of increased groundwater use on spring flow and other natural resources.

PERFORMANCE STANDARD: Attend at least once per year a meeting of a natural resource conservation association.

5. GOAL: DROUGHT CONDITIONS

MANAGEMENT OBJECTIVE: Provide Drought Severity information.

PERFORMANCE STANDARD: Post the Palmer Drought severity index value on the District Web Site bi-monthly.

6. GOAL: WATER CONSERVATION: To gather and publicize the necessary information to enable the District to promote water conservation. To initiate collection of information through monitoring and assembling existing information and create a data base to help define existing conditions of the aquifers, concerning water availability and quality; and to provide a base line to help determine any future trends in water use, water level drawdown, and water quality.

MANAGEMENT OBJECTIVE: Construct comprehensive maps of the District showing all major permitted wells. Information on the wells including well logs will be keyed to map locations. Obtain and include other available information on wells in the District from the Texas Water Development Board and other water resource agencies.

PERFORMANCE STANDARDS: Report annually to the Board on the progress of the maps and data base, the number of requests for information, and the usefulness of the information on the maps and data base.

MANAGEMENT OBJECTIVE: Provide portable flow meters for flow measurements in the District, monitor MesoNet rain gages, and establish an observation well for monitoring representative irrigation well water use in relationship to water use, rainfall, and static waterb levels.

PERFORMANCE STANDARD: Report annually to the Board the use of flow meters within the District. Provide MesoNet rainfall summaries in the Manager's Reports.

MANAGEMENT OBJECTIVE: Collect well log and location of new wells drilled within the District. Construct a data base with the available well information which includes a District map with major irrigation wells located.

PERFORMANCE STANDARD: Report annually to the Board on the progress of the District map and the available data.

MANAGEMENT OBJECTIVE: Establish a cooperative education program with each County Agent to provide an annual presentation to a school, an agricultural producers group, and a general public meeting in each county.

PERFORMANCE STANDARDS: Report annually to the Board the number of presentations provided.

MANAGEMENT OBJECTIVE: Coordinate District activities with stakeholders within the District, and help landowners as requested, if requests are consistent with District goals.

PERFORMANCE STANDARD: Attend at least once per year a meeting of a Citizens group such as the Lions Club, Rotary Club, Chamber of Commerce, Farm Bureau, or a wildlife association and give a presentation of the activities of the District.

7. GOAL: RAINWATER HARVESTING

MANAGEMENT OBJECTIVE: Demonstrate feasibility of rainwater harvesting in the District area.

PERFORMANCE STANDARD: Develop a project implementation plan by December 31, 2017. Report results of plan implementation in the annual report.

8. GOAL: BRUSH CONTROL

MANAGEMENT OBJECTIVE: Support the NRCS Brush Control conferences and workshops.

PERFORMANCE STANDARD: At least once per year attend the NRCS Brush Control conference. Document attendance in the District Annual Report.

9. GOAL: MONITOR DESIRED FUTURE CONDITION STATUS

MANAGEMENT OBJECTIVE: The District will annually measure water levels in at least one monitoring well in Seymour Aquifer Pod 3; at least one monitoring well in each of the counties in Seymour Aquifer Pod 4; at least one monitoring well in the Ogallala/Dockum area of Motley County, and at least one monitoring well in each of the counties in the Blaine Aquifer.

PERFORMANCE STANDARD: The District will construct water level tracking charts using the annual water level measurements, prepare annual water level trend analysis, compare the trend results to the desired future conditions of each aquifer subdivision, and provide the results in the District Annual report.

SB-1 MANAGEMENT GOALS DETERMINED NOT APPLICABLE

The following goals mandated to be addressed by Senate Bill 1 of the 75th Texas Legislature, 1997, have been determined not to apply to the Gateway Groundwater Conservation District for the reasons stated below.

1.0 Control and prevention of subsidence.

General subsidence is not observed in the District. Local sinkholes caused by groundwater dissolving the gypsum commonly found in the Blaine formation do occur occasionally. There are no available measures to prevent groundwater from dissolving gypsum.

2.0 Addressing Recharge Enhancement

Not applicable due to limitations of topography and soil conditions.

3.0 Addressing Precipitation Enhancement.

Presently not cost effective.

APPROVAL AND ADOPTION

Be it resolved that the Board of Directors of the Gateway Groundwater Conservation District does hereby approve and adopt this Groundwater Management Plan in open meeting on August 25, 2015.

______________________ President	______________________ Member
______________________ Vice-President	______________________ Member
______________________ Secretary	______________________ Member
______________________ Member	______________________ Member

Texas Water Development Board
P.O. Box 13231, 1700 N. Congress Ave.
Austin, TX 78711-3231, www.twdb.state.tx.us
Phone (512) 463-7847, Fax (512) 475-2053

December 9, 2011

Mr. Jack Campsey
General Manager
Gateway Groundwater Conservation District
P.O. Box 338
Quanah, TX 79252

Re: Modeled available groundwater estimates for the Blaine, Dockum, Ogallala, and Seymour aquifers in Groundwater Management Area 6

Dear Mr. Campsey:

The Texas Water Code, Section 36.1084, Subsection (b), states that the Texas Water Development Board's (TWDB) Executive Administrator shall provide each groundwater conservation district and regional water planning group located wholly or partly in the groundwater management area with the modeled available groundwater in the management area based upon the desired future conditions adopted by the districts. This letter and the attached reports (GAM Run 10-031 MAG, GAM Run 10-056 MAG, GAM Run 10-057 MAG, and GAM Run 10-058 MAG) are in response to this directive.

As noted in the letter received by the TWDB on August 16, 2010, from Mike McGuire of the Rolling Plains Groundwater Conservation District on behalf of Groundwater Management Area 6, desired future conditions were adopted for the Blaine, Dockum, Ogallala, and Seymour aquifers on July 22, 2010. The desired future conditions for the Blaine and Seymour aquifers were modified on July 19, 2011, as noted in the letter from Mr. McGuire received by TWDB on August 1, 2011.

Modeled available groundwater is defined in the Texas Water Code, Section 36.001, Subsection (25), 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." This is different from "managed available groundwater," shown in the draft version of the Dockum and Ogallala reports, which was a permitting value and accounted for the estimated use exempt from permitting. This change was made to reflect changes in statute by the 82nd Legislature, effective September 1, 2011. For use in the regional water planning process, modeled available groundwater estimates have been reported by aquifer, county, river basin, regional water planning area, groundwater conservation district, and any other subdivision of the aquifer designated by the management area (if applicable).
We encourage open communication and coordination between groundwater conservation districts, regional water planning groups, and the TWDB to ensure that the modeled available groundwater reported in regional water plans and groundwater management plans are not in conflict. We estimated modeled available groundwater that would have to occur to achieve the desired future condition using the best available scientific tools. However, these estimates are based on assumptions of the magnitude and distribution of projected pumping in the aquifer. It is, therefore, important for groundwater conservation

districts to monitor whether their management of pumping is achieving their desired future conditions. Districts are encouraged to continue to work with the TWDB to better define available groundwater as additional information may help better assess responses of the aquifer to pumping and its distribution now and in the future.

If you have any questions, please contact Ms. Rima Petrossian of my staff at 512-936-2420 or rima.petrossian@twdb.state.tx.us for further information.

Sincerely,

Melanie Callahan
Interim Executive Administrator

Attachments: GAM Run 10-031 MAG
GAM Run 10-056 MAG
GAM Run 10-057 MAG
GAM Run 10-058 MAG

c w/atts.: L'Oreal Stepney, Deputy Director, Office of Water, Texas Commission of Environmental Quality
Kellye Rila, Texas Commission of Environmental Quality
Kelly Mills, Texas Commission of Environmental Quality
Simone Kiel, Freese & Nichols, Inc.
Tom Gooch, Freese & Nichols, Inc.
Kerry Maroney, Biggs & Mathews
David Dunn, HDR Engineering
Stefan Schuster, Daniel B. Stevens and Associates
Jim Conkwright, High Plains UWCD No. 1
Phil Ford, Brazos River Authority
Gary Pitner, Panhandle Regional Planning Commission
Robert E. Mace, Ph.D, P.G., Deputy Executive Administrator, Water Science and Conservation
Cindy Ridgeway, P.G., Groundwater Resources
Rima Petrossian, P.G., Groundwater Resources
Jerry Shi, Ph.D, Groundwater Resources
Wade Oliver, Groundwater Resources
Dan Hardin, Water Resources Planning
Matt Nelson, Water Resources Planning
Temple McKinnon, Water Resources Planning
Doug Shaw, Water Resources Planning
Angela Kennedy, Water Resources Planning
Lann Bookout, Water Resources Planning
Wendy Barron, Water Resources Planning

Groundwater Management Area 6 - Modeled Available Groundwater

Aquifer	County	Regional Water Planning Area	River Basin	Modeled Available Groundwater						TWDB Report
				2010	2020	2030	2040	2050	2060	
Dockum	Dickens	O	Brazos	2,126	2,126	2,126	2,126	2,126	2,126	GR 10-057 MAG
Dockum	Dickens	O	Red	1,584	1,584	1,584	1,584	1,584	1,584	GR 10-057 MAG
Dockum	Fisher	G	Brazos	2,880	2,880	2,880	2,880	2,880	2,880	GR 10-057 MAG
Dockum	Kent	G	Brazos	6,250	6,250	6,250	6,250	6,250	6,250	GR 10-057 MAG
Dockum	Motley	O	Red	2,860	2,860	2,860	2,860	2,860	2,860	GR 10-057 MAG
Ogallala	Dickens	O	Brazos	5,939	5,939	5,939	5,939	5,939	5,939	GR 10-031 MAG
Ogallala	Dickens	O	Red	6,400	6,400	6,400	6,181	6,181	5,655	GR 10-031 MAG
Ogallala	Motley	O	Red	9,936	9,936	9,936	9,936	9,936	9,576	GR 10-031 MAG
Blaine	Childress	A	Red	15,206	15,206	15,206	15,206	15,206	15,206	GR 10-056 MAG
Blaine	Collingsworth	A	Red	185,376	185,376	185,376	185,376	185,376	185,376	GR 10-056 MAG
Blaine	Cottle	B	Red	4,469	4,469	4,469	4,469	4,469	4,469	GR 10-056 MAG
Blaine	Fisher	G	Brazos	5,062	5,062	5,062	5,062	5,062	5,062	GR 10-056 MAG
Blaine	Foard	B	Red	23	23	23	23	23	23	GR 10-056 MAG
Blaine	Hall	A	Red	11,509	11,509	11,509	11,509	11,509	11,509	GR 10-056 MAG
Blaine	Hardeman	B	Red	5,198	5,198	5,198	5,198	5,198	5,198	GR 10-056 MAG
Blaine	King	B	Brazos	6,977	6,977	6,977	6,977	6,977	6,977	GR 10-056 MAG
Blaine	King	B	Red	3,863	3,863	3,863	3,863	3,863	3,863	GR 10-056 MAG
Seymour	Archer	B	Red	35	35	35	35	35	35	GR 10-058 MAG
Seymour	Baylor	B	Brazos	3,207	3,168	3,168	3,168	3,168	3,168	GR 10-058 MAG
Seymour	Baylor	B	Red	681	642	619	619	619	619	GR 10-058 MAG
Seymour	Childress	A	Red	716	732	717	712	712	712	GR 10-058 MAG
Seymour	Clay	B	Red	787	787	787	787	787	787	GR 10-058 MAG
Seymour	Collingsworth	A	Red	17,542	16,010	14,250	13,348	11,329	10,241	GR 10-058 MAG
Seymour	Fisher	G	Brazos	2,936	2,935	2,931	2,920	2,915	2,733	GR 10-058 MAG
Seymour	Foard	B	Red	4,907	4,906	4,691	4,662	4,662	4,691	GR 10-058 MAG
Seymour	Hall	A	Red	12,406	12,020	11,462	10,866	11,085	11,172	GR 10-058 MAG
Seymour	Hardeman	B	Red	430	430	430	431	431	431	GR 10-058 MAG
Seymour	Haskell	G	Brazos	49,464	46,180	44,575	42,358	42,524	43,617	GR 10-058 MAG
Seymour	Jones	G	Brazos	2,918	2,918	2,918	2,918	2,918	2,918	GR 10-058 MAG
Seymour	Kent	G	Brazos	1,184	1,181	1,180	1,180	1,179	1,179	GR 10-058 MAG
Seymour	Knox	G	Brazos	40,076	37,628	34,244	30,288	28,569	30,979	GR 10-058 MAG
Seymour	Knox	G	Red	2,350	1,591	1,365	1,213	1,136	1,061	GR 10-058 MAG
Seymour	Motley	O	Red	1,783	1,776	1,769	1,769	1,685	1,685	GR 10-058 MAG

Groundwater Management Area 6 - Modeled Available Groundwater

Aquifer	County	Regional Water Planning Area	River Basin	Modeled Available Groundwater						TWDB Report
				2010	2020	2030	2040	2050	2060	
Seymour	Stonewall	G	Brazos	240	233	230	224	215	214	GR 10-058 MAG
Seymour	Throckmorton	G	Brazos	115	115	115	115	115	115	GR 10-058 MAG
Seymour	Wichita	B	Red	2,240	2,295	2,295	2,288	2,291	2,291	GR 10-058 MAG
Seymour	Wilbarger	B	Red	29,263	29,421	29,421	29,421	29,297	28,925	GR 10-058 MAG
Seymour	Young	G	Brazos	309	309	258	258	258	258	GR 10-058 MAG

Estimated Historical Groundwater Use And 2012 State Water Plan Datasets:

Gateway Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Resources Division
Groundwater Technical Assistance Section
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(512) 463-7317
July 7, 2015

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 part 1 are:

1. Estimated Historical Groundwater Use (checklist Item 2)

   from the TWDB Historical Water Use Survey (WUS)

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

   reports 2-5 are from the 2012 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report. 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 2012 SWP data available as of 7/7/2015. Although it does not happen frequently, neither of these datasets are static so they are subject to change pending the availability of more accurate WUS data or an amendment to the 2012 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 2012 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

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

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

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

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

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

Estimated Historical Water Use

TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2014. TWDB staff anticipates the calculation and posting of these estimates at a later date.

CHILDRESS COUNTY *93.94 % (multiplier)* All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	22	0	0	0	12,433	182	12,637
	SW	1,407	0	0	0	0	20	1,427
2012	GW	26	0	0	0	17,430	235	17,691
	SW	1,528	0	0	0	0	26	1,554
2011	GW	34	0	0	0	16,402	267	16,703
	SW	1,658	0	0	0	0	30	1,688
2010	GW	57	0	0	0	8,883	259	9,199
	SW	1,533	0	0	0	0	29	1,562
2009	GW	79	0	0	0	16,556	257	16,892
	SW	1,548	25	0	0	0	28	1,601
2008	GW	113	0	0	0	12,905	286	13,304
	SW	1,627	25	0	0	0	32	1,684
2007	GW	107	0	0	0	8,816	343	9,266
	SW	1,489	25	0	0	0	38	1,552
2006	GW	117	0	0	0	9,309	286	9,712
	SW	1,675	25	0	0	0	32	1,732
2005	GW	107	0	0	0	12,502	300	12,909
	SW	1,347	51	0	0	0	33	1,431
2004	GW	101	0	0	0	10,034	33	10,168
	SW	1,662	48	0	0	0	293	2,003
2003	GW	110	0	0	0	9,552	33	9,695
	SW	1,342	22	0	0	0	293	1,657
2002	GW	116	0	0	0	11,741	24	11,881
	SW	1,846	16	0	0	0	223	2,085
2001	GW	113	0	0	0	10,713	24	10,850
	SW	1,580	31	0	0	0	223	1,834
2000	GW	104	0	0	0	7,412	26	7,542
	SW	692	0	0	0	0	237	929

COTTLE COUNTY

100.00 % (multiplier)

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	396	0	1	0	5,125	203	5,725
	SW	12	0	0	0	0	87	99
2012	GW	403	0	3	0	5,337	280	6,023
	SW	12	0	0	0	0	120	132
2011	GW	475	0	20	0	3,219	316	4,030
	SW	13	0	5	0	0	135	153
2010	GW	359	0	17	0	1,483	307	2,166
	SW	12	0	4	0	0	132	148
2009	GW	368	0	9	0	2,492	358	3,227
	SW	12	0	2	0	0	154	168
2008	GW	324	0	2	0	2,701	346	3,373
	SW	12	0	0	0	0	148	160
2007	GW	397	0	0	0	2,394	381	3,172
	SW	11	0	0	0	0	163	174
2006	GW	596	0	0	0	3,999	322	4,917
	SW	11	0	0	0	0	138	149
2005	GW	382	0	0	0	4,132	322	4,836
	SW	12	0	0	0	0	138	150
2004	GW	301	0	0	0	4,548	50	4,899
	SW	9	0	0	0	0	449	458
2003	GW	439	0	0	0	3,569	52	4,060
	SW	12	0	0	0	0	464	476
2002	GW	478	0	0	0	5,136	49	5,663
	SW	10	0	0	0	0	433	443
2001	GW	501	0	0	0	4,369	49	4,919
	SW	12	0	0	0	0	434	446
2000	GW	470	0	0	0	4,201	50	4,721
	SW	10	0	0	0	0	449	459

FOARD COUNTY

100.00 % (multiplier)

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	35	0	0	0	2,055	24	2,114
	SW	218	0	0	0	0	220	438
2012	GW	42	0	0	0	3,919	25	3,986
	SW	223	0	0	0	0	220	443
2011	GW	41	0	6	0	4,991	28	5,066
	SW	259	0	1	0	0	254	514
2010	GW	42	0	10	0	2,300	29	2,381
	SW	241	0	2	0	0	257	500
2009	GW	30	0	5	0	3,747	35	3,817
	SW	324	0	1	0	0	320	645
2008	GW	34	0	1	0	3,636	33	3,704
	SW	328	0	0	0	0	298	626
2007	GW	32	0	0	0	3,269	35	3,336
	SW	315	0	0	0	0	312	627
2006	GW	37	0	0	0	4,062	35	4,134
	SW	334	0	0	0	0	317	651
2005	GW	35	0	0	0	3,877	38	3,950
	SW	335	0	0	0	0	342	677
2004	GW	34	0	0	0	4,351	34	4,419
	SW	311	0	0	0	0	305	616
2003	GW	36	0	0	0	3,636	32	3,704
	SW	313	0	0	0	0	290	603
2002	GW	37	0	0	0	4,965	29	5,031
	SW	312	0	0	0	0	267	579
2001	GW	40	0	0	0	3,981	30	4,051
	SW	313	0	0	0	0	270	583
2000	GW	41	0	0	0	3,889	28	3,958
	SW	317	0	0	0	0	251	568

HARDEMAN COUNTY

100.00 % (multiplier)

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	74	0	0	0	9,708	138	9,920
	SW	428	182	0	0	0	208	818
2012	GW	96	252	4	0	17,067	194	17,613
	SW	462	188	21	0	0	290	961
2011	GW	84	252	12	0	15,624	249	16,221
	SW	543	188	43	0	0	374	1,148
2010	GW	92	252	9	0	5,697	227	6,277
	SW	527	170	73	0	0	341	1,111
2009	GW	110	0	6	0	8,187	240	8,543
	SW	632	236	39	0	0	360	1,267
2008	GW	134	0	3	0	7,659	241	8,037
	SW	548	236	13	0	0	362	1,159
2007	GW	127	0	0	0	5,788	160	6,075
	SW	618	274	50	0	0	240	1,182
2006	GW	143	310	0	0	7,024	182	7,659
	SW	699	0	42	0	265	274	1,280
2005	GW	140	0	4	0	7,682	166	7,992
	SW	546	238	0	0	0	250	1,034
2004	GW	170	0	0	0	5,451	184	5,805
	SW	581	238	24	0	0	277	1,120
2003	GW	171	0	0	0	5,126	184	5,481
	SW	721	238	29	254	0	276	1,518
2002	GW	172	0	0	0	7,687	187	8,046
	SW	512	238	4	254	0	280	1,288
2001	GW	173	0	0	0	5,541	204	5,918
	SW	802	238	18	4,196	0	306	5,560
2000	GW	174	0	0	0	5,330	192	5,696
	SW	784	391	4	949	0	288	2,416

MOTLEY COUNTY

100.00 % (multiplier)

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	295	0	0	0	6,516	240	7,051
	SW	11	0	0	0	0	80	91
2012	GW	313	0	0	0	12,980	278	13,571
	SW	0	0	0	0	0	92	92
2011	GW	353	0	104	0	11,373	315	12,145
	SW	15	0	103	0	0	105	223
2010	GW	284	0	88	0	6,067	320	6,759
	SW	12	0	87	0	0	106	205
2009	GW	294	0	76	0	10,554	350	11,274
	SW	14	0	75	0	0	116	205
2008	GW	303	0	64	0	11,621	337	12,325
	SW	21	0	63	0	0	112	196
2007	GW	284	0	0	0	8,651	375	9,310
	SW	19	0	0	0	0	125	144
2006	GW	294	0	0	0	9,326	375	9,995
	SW	16	0	0	0	0	125	141
2005	GW	267	0	0	0	8,522	337	9,126
	SW	17	0	0	0	0	112	129
2004	GW	259	0	0	0	9,943	37	10,239
	SW	14	0	0	0	0	336	350
2003	GW	304	0	0	0	10,234	36	10,574
	SW	15	0	0	0	0	321	336
2002	GW	280	0	0	0	9,175	41	9,496
	SW	18	0	0	0	0	366	384
2001	GW	335	0	0	0	3,837	42	4,214
	SW	39	0	0	0	0	381	420
2000	GW	352	0	0	0	9,159	41	9,552
	SW	25	0	0	0	9	366	400

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

CHILDRESS COUNTY

93.94 % (multiplier)

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
A	CHILDRESS	RED	GREENBELT LAKE/RESERVOIR	1,457	1,481	1,502	1,509	1,510	1,471
A	COUNTY-OTHER	RED	GREENBELT LAKE/RESERVOIR	184	187	190	191	191	186
A	IRRIGATION	RED	RED RIVER RUN-OF-RIVER IRRIGATION	26	26	26	26	26	26
A	LIVESTOCK	RED	LIVESTOCK LOCAL SUPPLY	282	282	282	282	282	282
A	MINING	RED	OTHER LOCAL SUPPLY	20	20	20	20	20	20
	Sum of Projected Surface Water Supplies (acre-feet/year)			**1,969**	**1,996**	**2,020**	**2,028**	**2,029**	**1,985**

COTTLE COUNTY

100.00 % (multiplier)

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
B	IRRIGATION	RED	RED RIVER COMBINED RUN-OF-RIVER IRRIGATION	13	13	13	13	13	13
B	LIVESTOCK	RED	LIVESTOCK LOCAL SUPPLY	449	449	449	449	449	449
	Sum of Projected Surface Water Supplies (acre-feet/year)			**462**	**462**	**462**	**462**	**462**	**462**

FOARD COUNTY

100.00 % (multiplier)

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
B	COUNTY-OTHER	RED	GREENBELT LAKE/RESERVOIR	68	68	68	68	68	68
B	CROWELL	RED	GREENBELT LAKE/RESERVOIR	332	317	302	289	280	269
B	LIVESTOCK	RED	LIVESTOCK LOCAL SUPPLY	251	251	251	251	251	251
	Sum of Projected Surface Water Supplies (acre-feet/year)			**651**	**636**	**621**	**608**	**599**	**588**

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

HARDEMAN COUNTY

100.00 % (multiplier)

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
B	CHILLICOTHE	RED	GREENBELT LAKE/RESERVOIR	61	55	53	51	50	49
B	COUNTY-OTHER	RED	GREENBELT LAKE/RESERVOIR	210	210	210	210	210	210
B	IRRIGATION	RED	RED RIVER COMBINED RUN-OF-RIVER IRRIGATION	148	148	148	148	148	148
B	LIVESTOCK	RED	LIVESTOCK LOCAL SUPPLY	288	288	288	288	288	288
B	MANUFACTURING	RED	GREENBELT LAKE/RESERVOIR	449	478	509	542	576	576
B	MINING	RED	OTHER LOCAL SUPPLY	7	7	7	7	7	7
B	QUANAH	RED	GREENBELT LAKE/RESERVOIR	652	612	589	544	511	463
B	STEAM ELECTRIC POWER	RED	PAULINE/GROESBECK LAKE/RESERVOIR	1,200	1,200	1,200	1,200	1,200	1,200
	Sum of Projected Surface Water Supplies (acre-feet/year)			**3,015**	**2,998**	**3,004**	**2,990**	**2,990**	**2,941**

MOTLEY COUNTY

100.00 % (multiplier)

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
O	LIVESTOCK	RED	LIVESTOCK LOCAL SUPPLY	636	647	659	671	684	698
	Sum of Projected Surface Water Supplies (acre-feet/year)			**636**	**647**	**659**	**671**	**684**	**698**

Projected Water Demands
TWDB 2012 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.

CHILDRESS COUNTY

93.94 % (multiplier) All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
A	CHILDRESS	RED	1,457	1,481	1,502	1,509	1,510	1,471
A	MINING	RED	16	15	15	15	15	15
A	IRRIGATION	RED	6,968	5,185	5,026	4,761	4,232	3,703
A	LIVESTOCK	RED	346	442	443	444	446	448
A	COUNTY-OTHER	RED	184	187	190	191	191	186
	Sum of Projected Water Demands (acre-feet/year)		**8,971**	**7,310**	**7,176**	**6,920**	**6,394**	**5,823**

COTTLE COUNTY

100.00 % (multiplier) All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	LIVESTOCK	RED	387	387	387	387	387	387
B	MINING	RED	25	27	28	30	30	30
B	IRRIGATION	RED	4,301	4,172	4,047	3,925	3,808	3,808
B	PADUCAH	RED	316	300	277	256	239	232
B	COUNTY-OTHER	RED	79	76	76	73	71	69
	Sum of Projected Water Demands (acre-feet/year)		**5,108**	**4,962**	**4,815**	**4,671**	**4,535**	**4,526**

FOARD COUNTY

100.00 % (multiplier) All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	LIVESTOCK	RED	289	289	289	289	289	289
B	IRRIGATION	RED	4,829	4,684	4,543	4,407	4,275	4,275
B	MINING	RED	24	24	25	26	27	27
B	CROWELL	RED	277	264	252	241	233	224
B	COUNTY-OTHER	RED	116	114	110	102	97	89
	Sum of Projected Water Demands (acre-feet/year)		**5,535**	**5,375**	**5,219**	**5,065**	**4,921**	**4,904**

Projected Water Demands
TWDB 2012 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.

HARDEMAN COUNTY

100.00 % (multiplier) All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	CHILLICOTHE	RED	117	109	106	102	100	98
B	COUNTY-OTHER	RED	172	164	153	144	136	120
B	QUANAH	RED	543	510	491	453	426	386
B	STEAM ELECTRIC POWER	RED	1,000	1,000	1,000	1,000	1,000	1,000
B	LIVESTOCK	RED	480	480	480	480	480	480
B	MINING	RED	3	3	2	2	2	2
B	MANUFACTURING	RED	374	398	424	452	480	480
B	IRRIGATION	RED	4,849	4,704	4,563	4,426	4,293	4,293
	Sum of Projected Water Demands (acre-feet/year)		**7,538**	**7,368**	**7,219**	**7,059**	**6,917**	**6,859**

MOTLEY COUNTY

100.00 % (multiplier) All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
O	IRRIGATION	RED	8,894	8,628	8,372	8,121	7,877	7,641
O	COUNTY-OTHER	RED	143	136	123	108	98	93
O	MANUFACTURING	RED	6	6	6	6	6	6
O	LIVESTOCK	RED	636	647	659	671	684	698
O	MINING	RED	9	4	3	1	0	0
O	MATADOR	RED	234	224	207	187	174	166
	Sum of Projected Water Demands (acre-feet/year)		**9,922**	**9,645**	**9,370**	**9,094**	**8,839**	**8,604**

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

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

CHILDRESS COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
A	CHILDRESS	RED	0	0	0	0	0	0
A	COUNTY-OTHER	RED	20	20	20	20	20	20
A	IRRIGATION	RED	236	238	240	241	241	237
A	LIVESTOCK	RED	232	230	228	227	225	223
A	MINING	RED	4	5	5	5	5	5
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

COTTLE COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	COUNTY-OTHER	RED	121	124	124	127	129	131
B	IRRIGATION	RED	237	366	491	613	730	730
B	LIVESTOCK	RED	109	109	109	109	109	109
B	MINING	RED	0	0	0	0	0	0
B	PADUCAH	RED	216	232	255	276	293	300
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

FOARD COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	COUNTY-OTHER	RED	65	67	71	79	84	92
B	CROWELL	RED	55	53	50	48	47	45
B	IRRIGATION	RED	426	571	712	848	980	980
B	LIVESTOCK	RED	0	0	0	0	0	0
B	MINING	RED	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

HARDEMAN COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	CHILLICOTHE	RED	24	26	27	29	30	31

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

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

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
B	COUNTY-OTHER	RED	73	81	92	101	109	125
B	IRRIGATION	RED	649	794	935	1,072	1,205	1,205
B	LIVESTOCK	RED	6	6	6	6	6	6
B	MANUFACTURING	RED	75	80	85	90	96	96
B	MINING	RED	4	4	5	5	5	5
B	QUANAH	RED	109	102	98	91	85	77
B	STEAM ELECTRIC POWER	RED	200	200	200	200	200	200
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**0**	**0**	**0**

MOTLEY COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
O	COUNTY-OTHER	RED	0	0	0	0	0	0
O	IRRIGATION	RED	-1,332	-1,266	-1,208	-1,154	-1,092	-1,025
O	LIVESTOCK	RED	0	0	0	0	0	0
O	MANUFACTURING	RED	0	0	0	0	0	0
O	MATADOR	RED	0	0	0	0	0	0
O	MINING	RED	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet/year)		**-1,332**	**-1,266**	**-1,208**	**-1,154**	**-1,092**	**-1,025**

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

CHILDRESS COUNTY

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

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
IRRIGATION, RED (A)							
IRRIGATION CONSERVATION	CONSERVATION [CHILDRESS]	0	1,640	1,704	1,819	1,883	1,946
Sum of Projected Water Management Strategies (acre-feet/year)		**0**	**1,640**	**1,704**	**1,819**	**1,883**	**1,946**

MOTLEY COUNTY

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

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
IRRIGATION, RED (O)							
IRRIGATION WATER CONSERVATION	CONSERVATION [MOTLEY]	886	798	718	646	582	523
MATADOR, RED (O)							
MUNICIPAL WATER CONSERVATION	CONSERVATION [MOTLEY]	20	37	49	57	63	62
Sum of Projected Water Management Strategies (acre-feet/year)		**906**	**835**	**767**	**703**	**645**	**585**

GAM Run 14-013: Gateway Groundwater Conservation District Management Plan

by William Kohlrenken, GISP
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-8279
April 10, 2015

Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by William Kohlrenken under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on April 10, 2015.

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GAM RUN 14-013: GATEWAY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by William Kohlrenken, GISP
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-8279
April 10, 2015

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the executive administrator. 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 the Gateway Groundwater Conservation District—fulfills the requirements noted above. Part 1 of the two-part package is the Estimated Historical Water Use/State Water Plan data report. The District 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 Gateway Groundwater Conservation District should be adopted by the district on or before November 27, 2015 and submitted to the executive administrator of the TWDB on or before December 27, 2015. The current management plan for the Gateway Groundwater Conservation District expires on February 25, 2016.

This report discusses the methods, assumptions, and results from model runs using the groundwater availability models for the 1) Seymour and Blaine aquifers (Ewing and others, 2004), 2) Dockum Aquifer (Ewing and other, 2008), and 3) the Edwards-Trinity (High Plains) Aquifer and the southern portion of the Ogallala Aquifer (Blandford and others, 2008). This model run replaces the results of GAM Run 10-007 (Hassan, 2010). GAM Run 14-013 meets current standards set after the release of GAM Run 10-007. Because of slight changes in district boundaries since 2010, the values reported in this report differ from GAM Run 10-007. Tables 1 through 4 summarize the groundwater availability model data required by statute, and Figures 1 through 4 show the area of the models from which the values in the table were extracted. If after review of the figures, the Gateway Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model for the 1) Seymour and Blaine aquifers (Ewing and others, 2004), 2) Dockum Aquifer (Ewing and others, 2008), and 3) the southern portion of the Ogallala Aquifer and Edwards-Trinity (High Plains) Aquifer (Blandford and others, 2008) were run for this analysis. Gateway Groundwater Conservation District water budgets were extracted for the historical model period (1980 through 1999 for the Seymour and Blaine aquifers, 1980 through 1997 for the Dockum Aquifer, and 1980 through 2000 for the southern portion of the Ogallala Aquifer) 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 portion of the aquifer located within the district is summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Seymour and Blaine aquifers

- Version 1.01 of the groundwater availability model for the Seymour and Blaine Aquifers was used for this analysis. See Ewing and others (2004) for assumptions and limitations of the groundwater availability model.
- This groundwater availability model includes two layers, representing the Seymour Aquifer (Layer 1), and the Blaine Aquifer (Layer 2). In areas where the Blaine Aquifer does not exist the model roughly replicates various Permian units located in the area.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

Dockum Aquifer

- Version 1.01 of the groundwater availability model for the Dockum Aquifer was used for this analysis. See Ewing and others (2008) for assumptions and limitations of the groundwater availability model for the Dockum Aquifer.
- This groundwater availability model includes three layers which generally represent the Ogallala, Edwards-Trinity (High Plains), Edwards-Trinity (Plateau), Pecos Valley, and Rita Blanca aquifers (Layer 1), the upper portion of the Dockum Aquifer (Layer2), and the lower portion of the Dockum Aquifer (Layer 3 – referred to as the brackish/saline portion of the Dockum Formation in Table 1).
- The geologic units represented in Layer 1 of the groundwater availability model are only included in the model for the purpose of more accurately representing flow between these units and the Dockum Aquifer. This model is not intended to explicitly simulate flow in these overlying units (Ewing and others, 2008).
- The MODFLOW Drain package was used to simulate both evapotranspiration and springs. Only drain flow from model grid cells representing springs within the district were incorporated into the surface water outflow values shown in Table 1.
- Groundwater in the Dockum Aquifer ranges from fresh to brine in composition (Ewing and others, 2008). Groundwater with total dissolved solids of less than 1,000 milligrams per liter are considered fresh, total dissolved solids of 1,000 to 10,000 milligrams per liter are considered

brackish, and total dissolved solids between 10,000 and 35,000 milligrams per liter are considered brines.

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

Southern portion of the Ogallala Aquifer and Edwards-Trinity (High Plains) Aquifer

- Version 2.01 of the groundwater availability model for the southern portion of the Ogallala Aquifer and the Edwards-Trinity (High Plains) Aquifer was used for this analysis. This model is an expansion on and update to the previously developed southern portion of the Ogallala Aquifer described in Blandford and others (2003). See Blandford and others (2008) and Blandford and others (2003) for assumptions and limitations of the model.
- The model includes four layers representing the southern portion of the Ogallala Aquifer and the Edwards-Trinity (High Plains) Aquifer. The units comprising the Edwards-Trinity (High Plains) Aquifer (primarily Edwards, Comanche Peak, and Antlers Sand formations) are separated from the overlying Ogallala Aquifer by a layer of Cretaceous shale, where present. Water budgets for the district have been determined for the Ogallala Aquifer (Layer 1). The Edwards-Trinity (High Plains) Aquifer does not exist within the district boundaries.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the aquifers located within the district and averaged over the duration of the calibration and verification portion of the model run in the district, as shown in Tables 1 through 4.

- 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 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 the aquifer and adjacent 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.

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

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Blaine Aquifer	46,707
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Blaine Aquifer	17,050
Estimated annual volume of flow into the district within each aquifer in the district	Blaine Aquifer	18,074
Estimated annual volume of flow out of the district within each aquifer in the district	Blaine Aquifer	8,138
Estimated net annual volume of flow between each aquifer in the district	From the Blaine Aquifer to the Seymour and other overlying units	7,318
	From the Blaine Aquifer to the other Permian Units	20,956

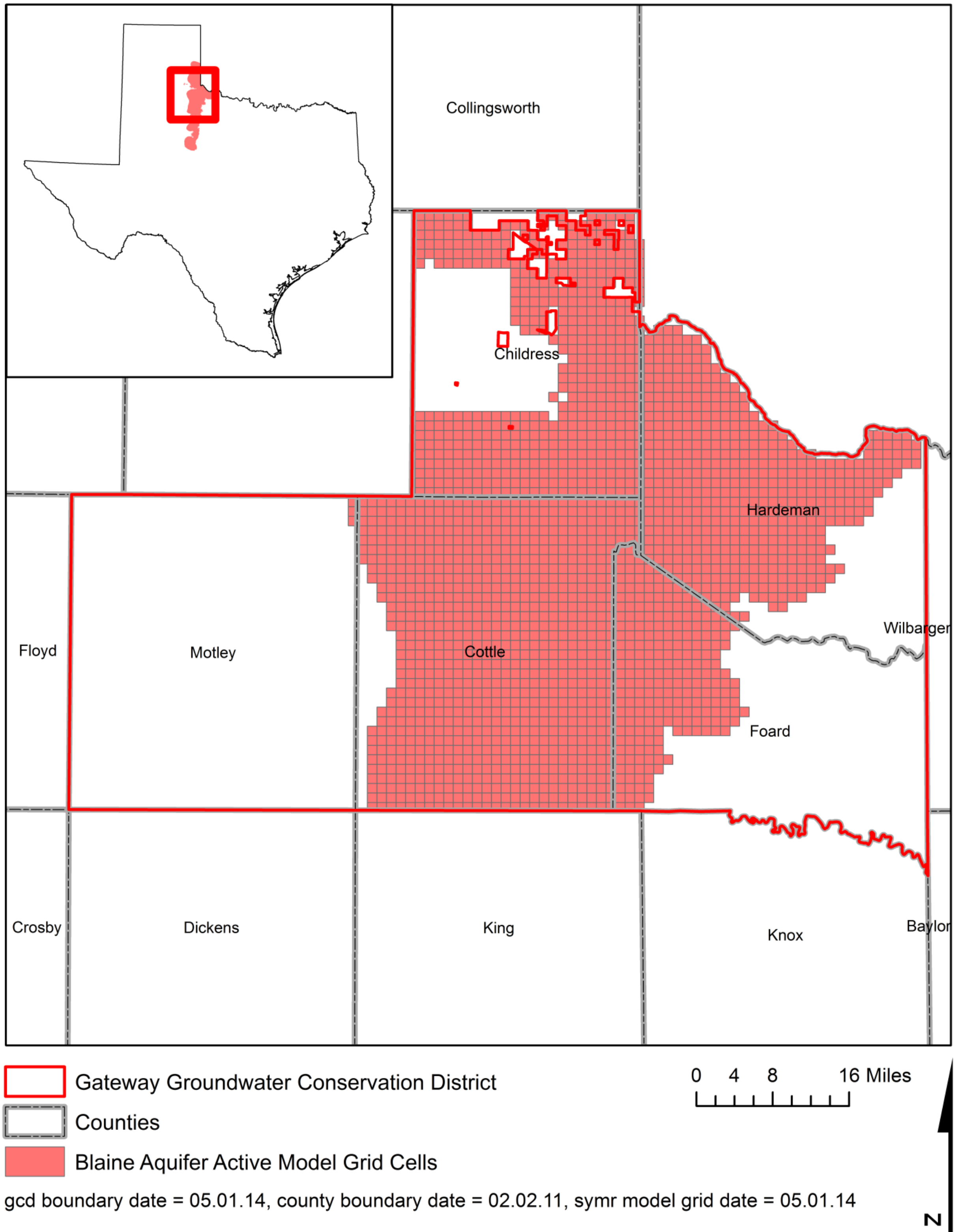

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AND BLAINE AQUIFERS FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE BLAINE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Dockum Aquifer	619
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Dockum Aquifer	1,633
Estimated annual volume of flow into the district within each aquifer in the district	Dockum Aquifer	2,397
Estimated annual volume of flow out of the district within each aquifer in the district	Dockum Aquifer	20
Estimated net annual volume of flow between each aquifer in the district	From the Dockum Aquifer into the Ogallala Aquifer and other overlying units	95
	From the Dockum Aquifer into the brackish/ saline portions of the Dockum Formation	649

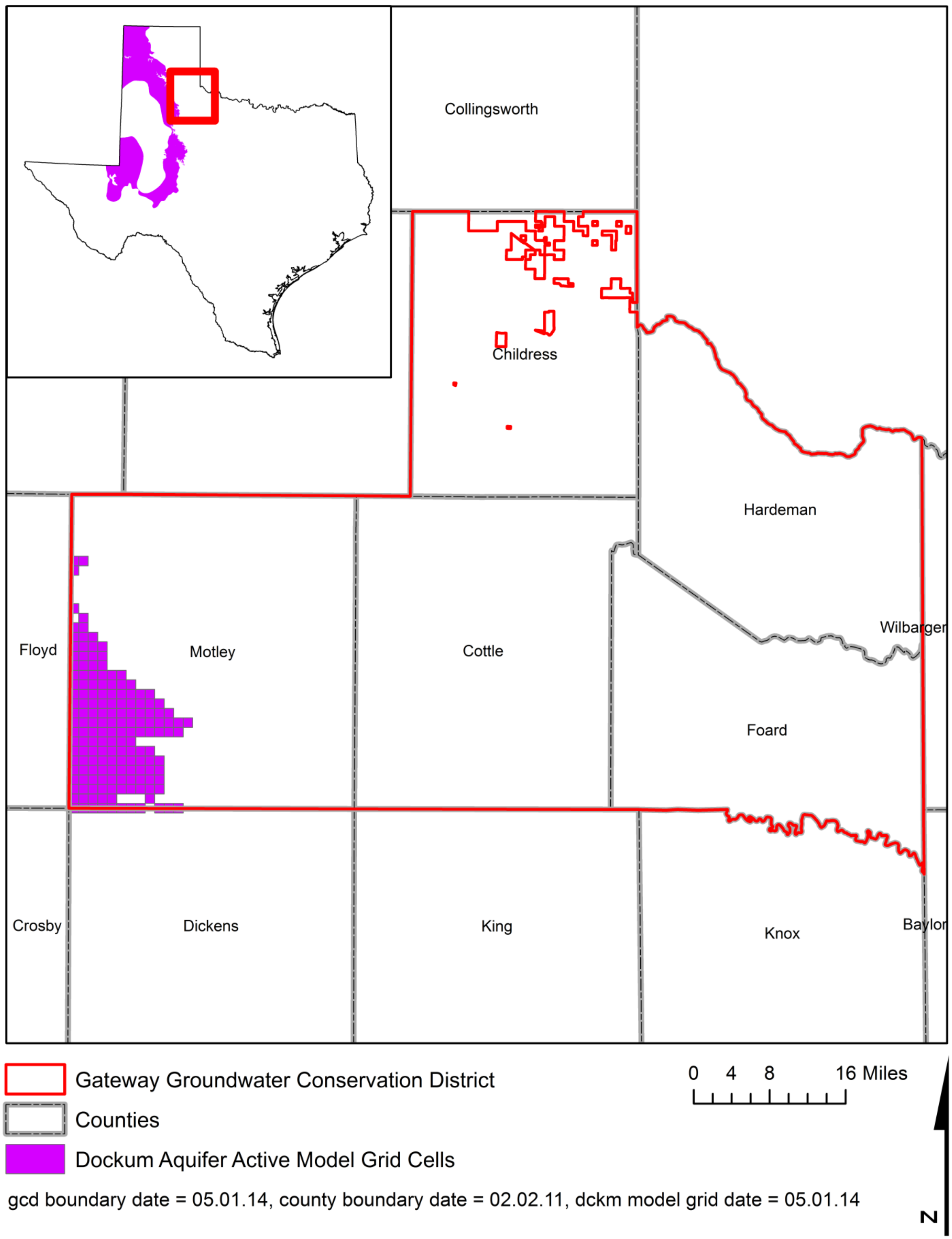

FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE DOCKUM AQUIFER FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE DOCKUM AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Ogallala Aquifer	456
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Ogallala Aquifer	1,944
Estimated annual volume of flow into the district within each aquifer in the district	Ogallala Aquifer	1,764
Estimated annual volume of flow out of the district within each aquifer in the district	Ogallala Aquifer	167
Estimated net annual volume of flow between each aquifer in the district	From the Ogallala Aquifer and other overlying units into the Dockum Aquifer*	95

* Amount taken from the Dockum Aquifer Groundwater Availability Model.

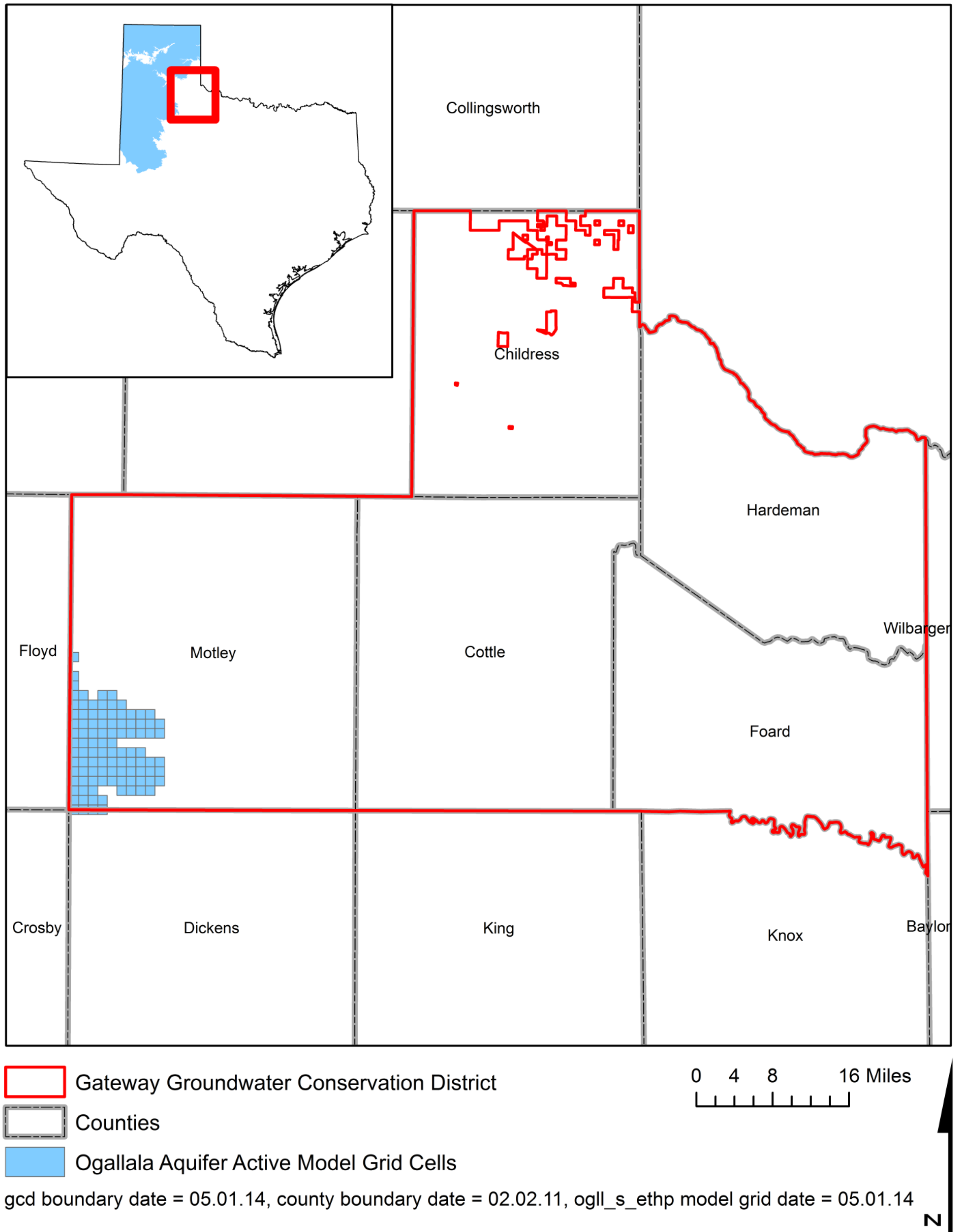

FIGURE 3: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR SOUTHERN PORTION OF THE OGALLALA AQUIFER AND THE EDWARDS-TRINITY (HIGH PLAINS) AQUIFER IN TEXAS AND NEW MEXICO FROM WHICH THE INFORMATION IN TABLE 3 WAS EXTRACTED (THE OGALLALA AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Seymour Aquifer	51,968
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Seymour Aquifer	5,613
Estimated annual volume of flow into the district within each aquifer in the district	Seymour Aquifer	1,400
Estimated annual volume of flow out of the district within each aquifer in the district	Seymour Aquifer	7,036
Estimated net annual volume of flow between each aquifer in the district	From the Blaine Aquifer and other Permian Units into the Seymour Aquifer	7,484

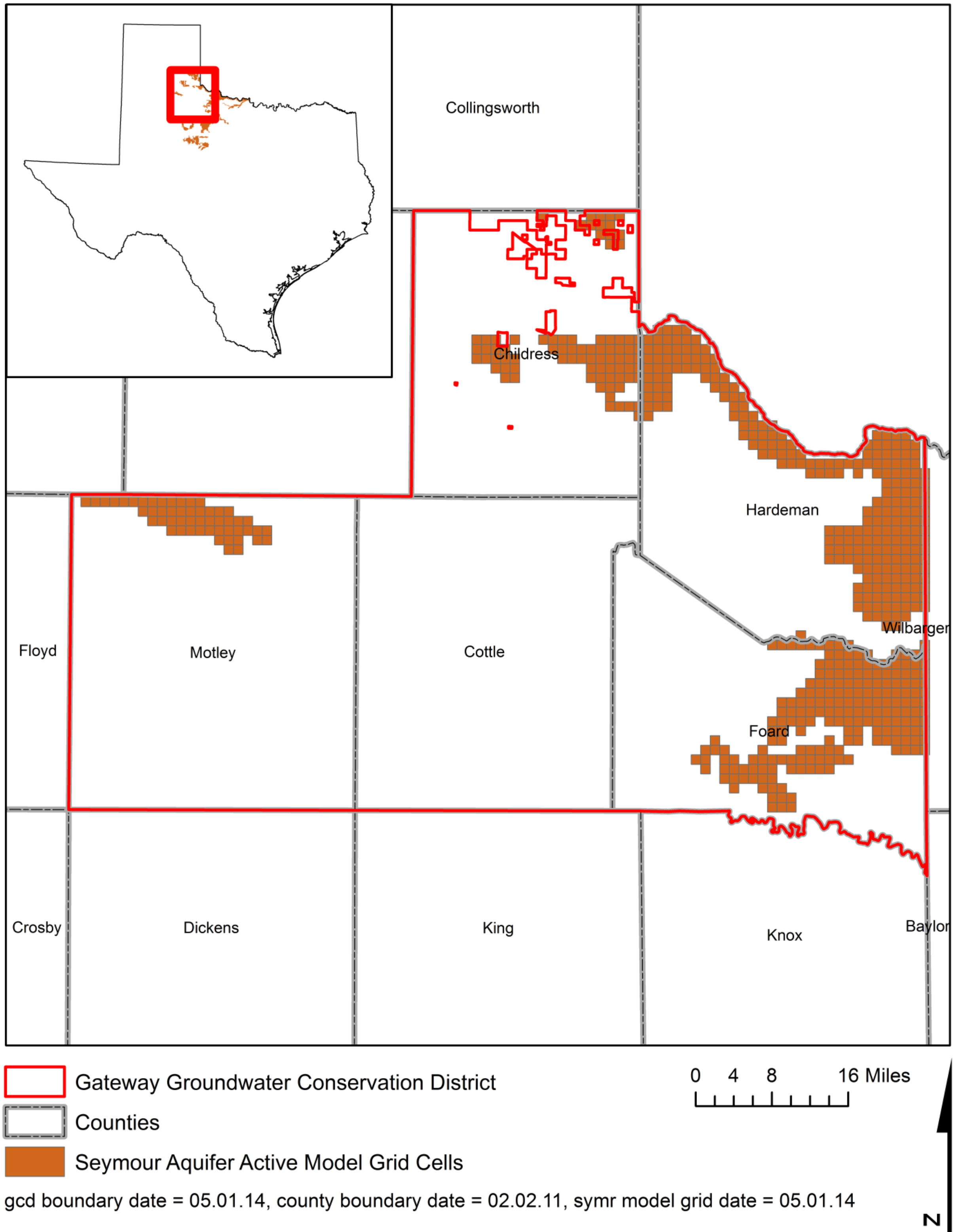

FIGURE 4: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE SEYMOUR AND BLAINE AQUIFERS FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE SEYMOUR AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

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

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

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