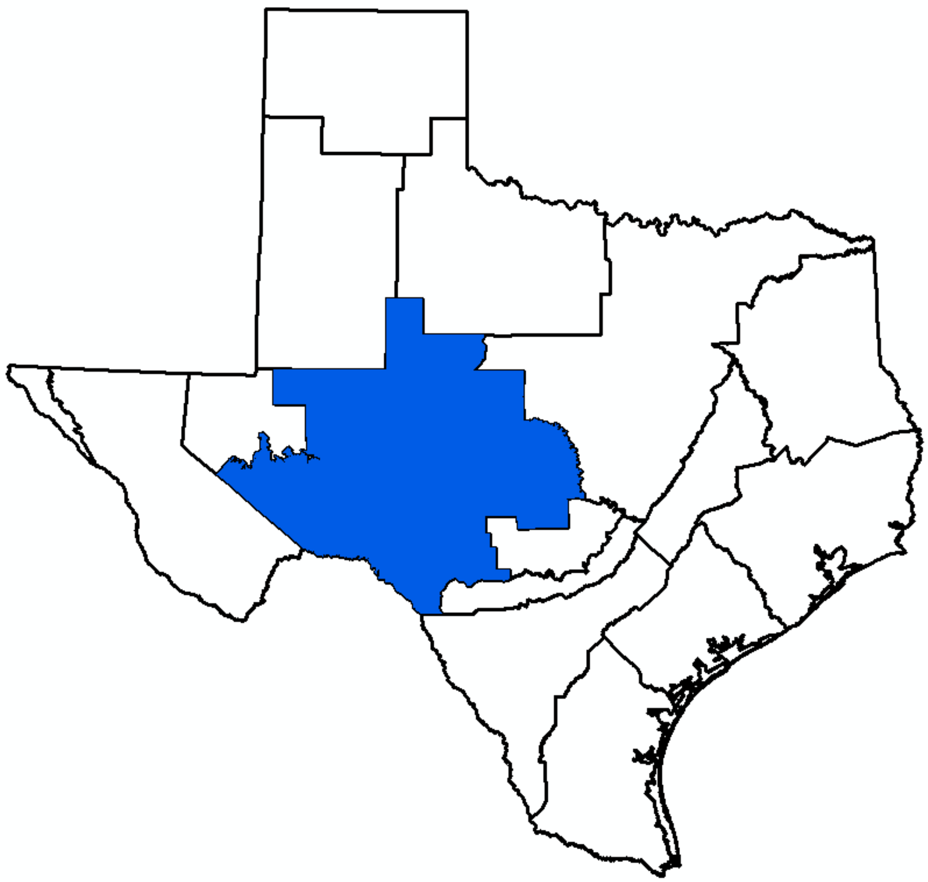
GMA 7 Explanatory Report - Final

Ogallala and Dockum Aquifers



Prepared for:

Groundwater Management Area 7

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1.0 Groundwater Management Area 7

Groundwater Management Area 7 is one of sixteen groundwater management areas in Texas and covers that portion of west Texas that is underlain by the Edwards-Trinity (Plateau) Aquifer (Figure 1).

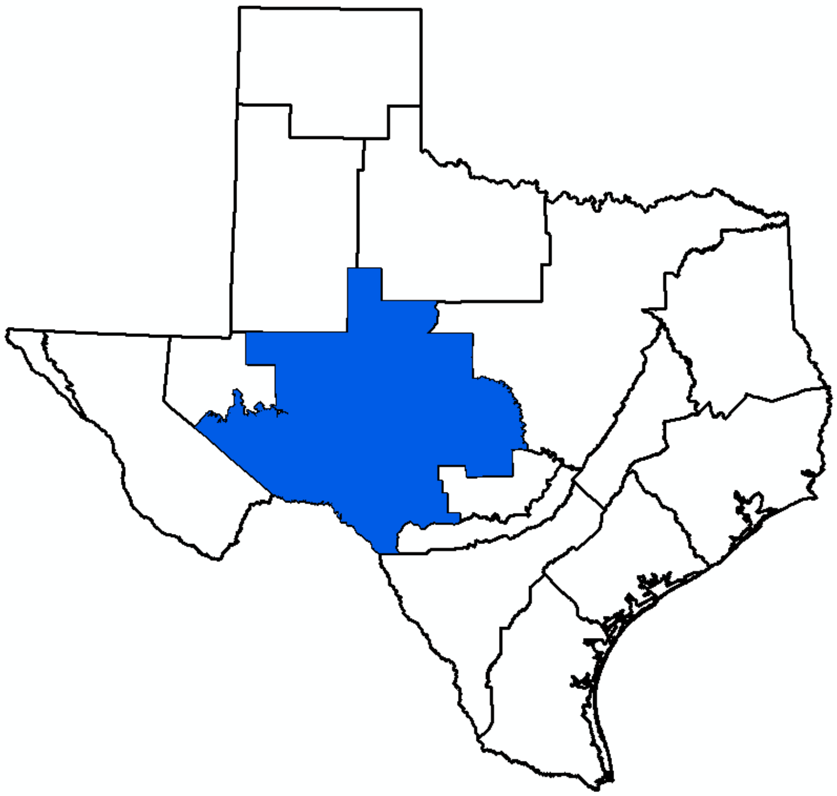

Figure 1. Groundwater Management Area 7

Groundwater Management Area 7 covers all or part of the following counties: Coke, Coleman, Concho, Crockett, Ector, Edwards, Gillespie, Glasscock, Irion, Kimble, Kinney, Llano, Mason, McCulloch, Menard, Midland, Mitchell, Nolan, Pecos, Reagan, Real, Runnels, San Saba, Schleicher, Scurry, Sterling, Sutton, Taylor, Terrell, Tom Green, Upton, and Uvalde (Figure 2).

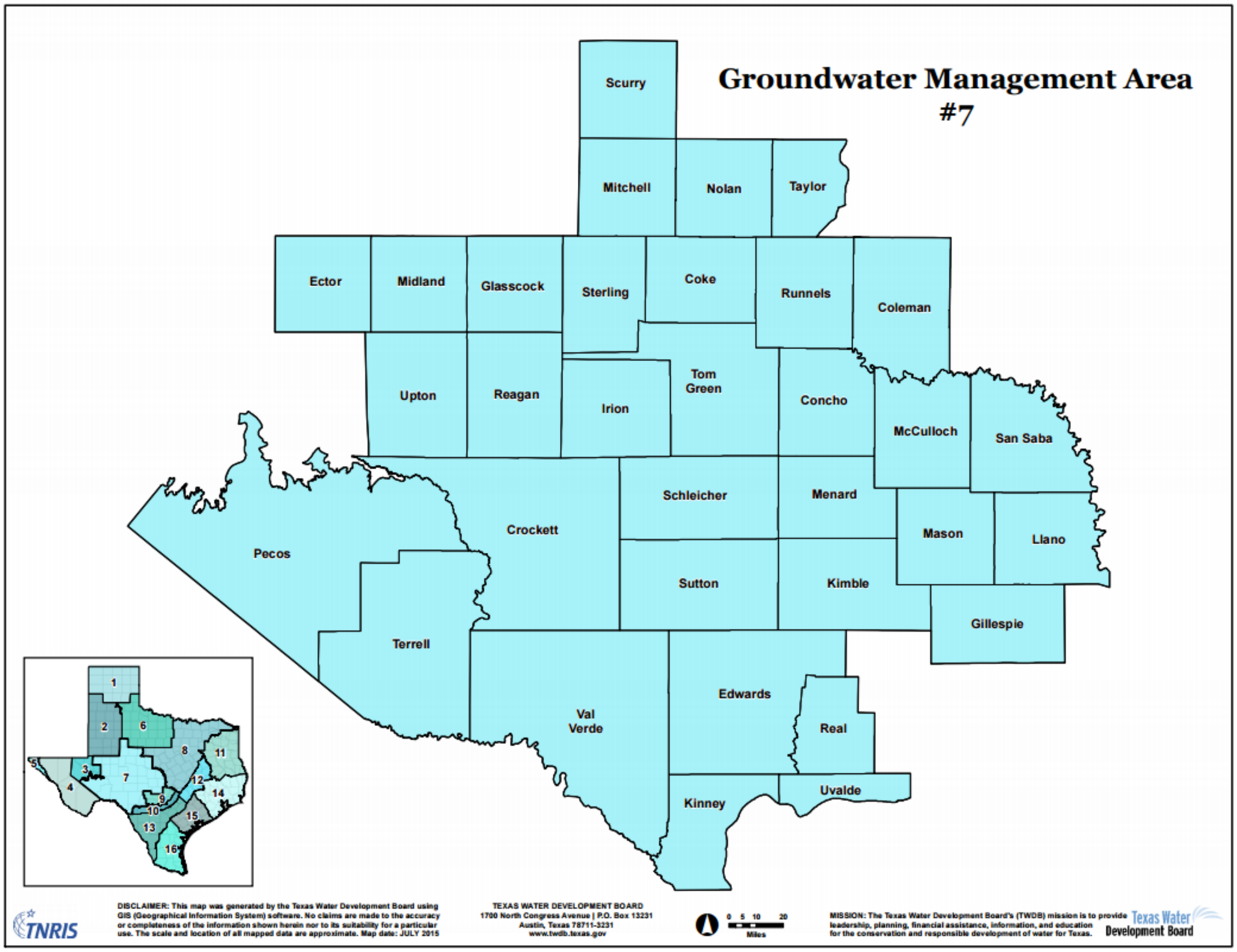

Figure 2. GMA 7 Counties (from TWDB)

There are 20 groundwater conservation districts in Groundwater Management Area 7: Coke County Underground Water Conservation District, Crockett County Groundwater Conservation District, Glasscock Groundwater Conservation District, Hickory Underground Water Conservation District No. 1, Hill County Underground Water Conservation District, Irion County Water Conservation District, Kimble County Groundwater Conservation District, Kinney County Groundwater Conservation District, Lipan-Kickapoo Water Conservation District, Lone Wolf Groundwater Conservation District, Menard County Underground Water District, Middle Pecos Groundwater Conservation District, Plateau Underground Water Conservation and Supply District, Real-Edwards Conservation and Reclamation District Santa Rita Underground Water Conservation District, Sterling County Underground Water Conservation District, Sutton County Underground Water Conservation District, Terrell County Groundwater Conservation District, Uvalde County Underground Water Conservation District, and Wes-Tex Groundwater Conservation District (Figure 3).

The Edwards Aquifer Authority is also partially inside of the boundaries of GMA 7, but are exempt from participation in the joint planning process.

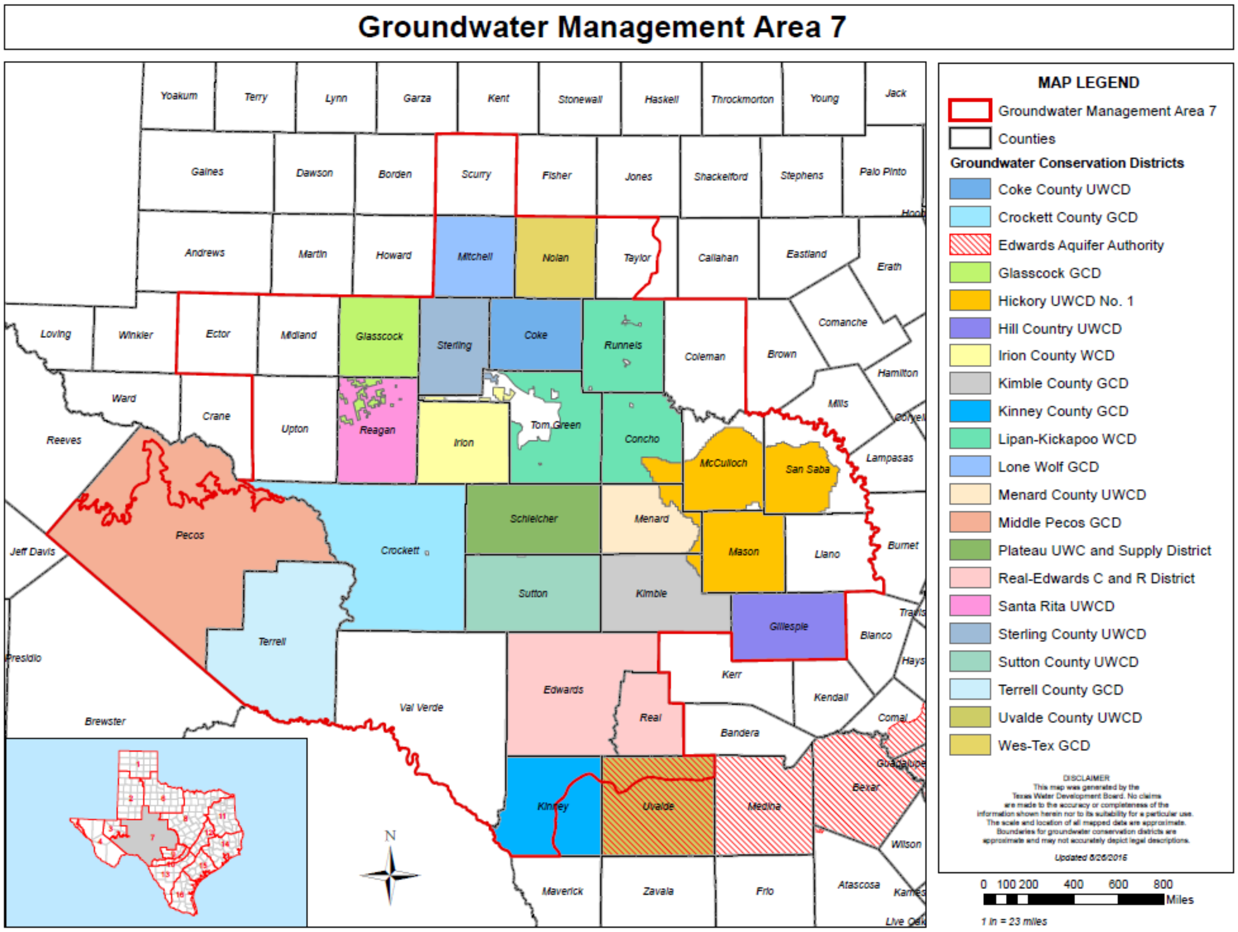

Figure 3. Groundwater Conservation Districts in GMA 7 (from TWDB)

The explanatory report covers the Dockum and Ogallala aquifers. As described in George and others (2011):

> ***The Dockum Aquifer*** *is a minor aquifer found in the northwest part of the state. It is defined stratigraphically by the Dockum Group and includes, from oldest to youngest, the Santa Rosa Formation, the Tecovas Formation, the Trujillo Sandstone, and the Cooper Canyon Formation. The Dockum Group consists of gravel, sandstone, siltstone, mudstone, shale, and conglomerate. Groundwater located in the sandstone and conglomerate units is recoverable, the highest yields coming from the coarsest grained deposits located at the middle and base of the group. Typically, the water-bearing sandstones are locally referred to as the Santa Rosa Aquifer. The water quality in the aquifer is generally poor—with freshwater in outcrop areas in the east and brine in the western subsurface portions of the aquifer—and the water is very hard. Naturally occurring radioactivity from uranium present within the aquifer has resulted in gross alpha radiation in excess of the state's primary drinking water standard. Radium-226 and -228 also occur in amounts above acceptable standards. Groundwater from the aquifer is used for irrigation, municipal water supply, and oil field waterflooding operations, particularly in the southern High Plains. Water level*

declines and rises have occurred in different areas of the aquifer. The regional water planning groups, in their 2006 Regional Water Plans, recommended several water management strategies that use the Dockum Aquifer, including new wells, desalination, and reallocation.

***The Ogallala Aquifer** is the largest aquifer in the United States and is a major aquifer of Texas underlying much of the High Plains region. The aquifer consists of sand, gravel, clay, and silt and has a maximum thickness of 800 feet. Freshwater saturated thickness averages 95 feet. Water to the north of the Canadian River is generally fresh, with total dissolved solids typically less than 400 milligrams per liter; however, water quality diminishes to the south, where large areas contain total dissolved solids in excess of 1,000 milligrams per liter. High levels of naturally occurring arsenic, radionuclides, and fluoride in excess of the primary drinking water standards are also present. The Ogallala Aquifer provides significantly more water for users than any other aquifer in the state. The availability of this water is critical to the economy of the region, as approximately 95 percent of groundwater pumped is used for irrigated agriculture. Throughout much of the aquifer, groundwater withdrawals exceed the amount of recharge, and water levels have declined fairly consistently through time. Although water level declines in excess of 300 feet have occurred in several areas over the last 50 to 60 years, the rate of decline has slowed, and water levels have risen in a few areas. The regional water planning groups for the Panhandle and Llano Estacado regions, in their 2006 Regional Water Plans, recommended numerous water management strategies using the Ogallala Aquifer, including drilling new wells, developing well fields, overdrafting, and reallocating supplies.*

2.0 Desired Future Condition

2.1 2010 Desired Future Conditions

GMA 7 adopted a desired future condition for the Ogallala Aquifer on July 29, 2010 as follows:

".. through the year 2060:

1) *Total decline in volume of water within Ector, Glasscock, and Midland counties in the southern portion of the Ogallala aquifer within GMA 7 at the end of the fifty-year period shall not exceed 50 percent of the volume of the aquifer in 2010.*
2) *The Ogallala Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.*

GMA 7 adopted a desired future condition for the Dockum Aquifer on July 29, 2010 as follows:

".. through the year 2060:

1) *Upper Dockum, as delineated in figure 1 of TWDB GAM Run 10-001: net total drawdown not to exceed 29 feet in Midland County; and*
2) *Lower Dockum, as delineated in figure 1 of TWDB GAM Run 10-001: net total drawdown not to exceed 4 feet in Ector, Mitchell, Pecos, Scurry, and Upton Counties (Lone Wolf GCD, Middle Pecos GCD); and*
3) *Lower Dockum Aquifer as delineated in Figure 1 of TWDB GAM Run 10-001: Drawdown not to exceed a net total of 39 feet in Nolan County (Wes-Tex GCD); and*
4) *The Dockum Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.*

The desired future conditions were adopted based on two separate groundwater availability models for the Ogallala and Dockum aquifers. In 2015, the TWDB received a final updated model that includes both the Ogallala and Dockum aquifers (High Plains Aquifer System Groundwater Availability Model, or HPAS).

2.2 2016 Desired Future Conditions

On April 21, 2016, the groundwater conservation districts in Groundwater Management Area 7 voted on proposed desired future conditions for the Ogallala and Dockum aquifers. These DFCs were developed based on predictive simulations with the High Plains Aquifer System Groundwater Availability Model (Deeds and Jigmond, 2015). The model is also known as the HPAS GAM, or simply the GAM. The GAM includes the Ogallala, Edwards-Trinity (High Plains), and Dockum aquifers.

The 2016 desired future conditions for the Dockum Aquifer in GMA 7 were based on Scenario 17 as described in Technical Memorandum 16-01:

1) Total net drawdown of the Dockum Aquifer not to exceed 14 feet in Reagan County (Santa Rita GCD) in 2070 as compared with 2012 aquifer levels;
2) Total net drawdown of the Dockum Aquifer not to exceed 52 feet in Pecos County (Middle Pecos GCD) in 2070 as compared with 2012 aquifer levels; and
3) The Dockum Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.

The desired future conditions for the Ogallala Aquifer in GMA 7 were based on Scenario 10 as described in Technical Memorandum 16-01:

1) Total net drawdown of the Ogallala Aquifer in Glasscock County (Glasscock GCD) in 2070, as compared with 2012 aquifer levels, not to exceed 6 feet; and
2) The Ogallala Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.

2.3 Discussion of Changes to Desired Future Conditions from 2010 to 2016.

The 2016 desired future conditions that were adopted by GMA 7 for the Dockum and Ogallala aquifers relied on a new model (HPAS GAM or new GAM). The new GAM was an updated tool that replaced the old Ogallala Aquifer GAM and the alternative GAM for the Dockum Aquifer that were the basis for the 2010 DFC and MAG. However, use of this new tool and the updated information that it yielded resulted in changes in 2016 to the DFCs and MAGs from 2010 the 2010 DFCs and MAGs. Many of the changes are simply reflective of the updated model. These changes to the DFC and/or the MAG could be easily misinterpreted and misused.

2.3.1 Ogallala Aquifer

An example of this potential misinterpretation is the report by TWDB (Hermitte and others, 2015). This report summarized differences between 2012 State Water Plan groundwater availability numbers and the MAGs developed from the DFCs that were adopted in 2010. There are many reasons for the noted differences, but Hermitte and others (2015) provided no context to the changes. In fact, there was no opportunity for stakeholders to provide comments to this report, it simply was published.

In many cases, the reported differences are directly attributable to updates in models, and the improved understanding that is the result of updating a model. However, the data and comparisons in Hermite and others (2015) report provide opportunities to mischaracterize these differences as simple policy choices to reduce groundwater availability. It is unfortunate that Hermitte and others (2015) chose not to provide context to their comparisons and leave so much room for misinterpretation of a complex process that relies on imperfect models.

In this case, the updated simulations of the Ogallala Aquifer using the HPAS were designed to evaluate the effects of a declining saturated thickness on well pumping rates. In reviewing the results and comparing them to the results of model runs using the old model in 2010, it is apparent that the MAG from 2010 reflects a large increase in pumping in Glasscock County during the first several years of the simulation to achieve an arbitrary 50/50 standard. Scenario 10 (on which the Glasscock County DFC is established assumed that the pumping in the first year of the simulation is 150 percent of the current pumping, which is a significant increase). Essentially, the achievement of an arbitrary 50/50 DFC would require an immediate increase in pumping that could not be sustained over the first few years of the simulation period. The new model shows the decrease in pumping associated with the declining groundwater levels and is a more realistic simulation of what could occur in the future.

2.3.2 Dockum Aquifer

The Dockum Aquifer includes a DFC for Pecos County that is includes all of Pecos County in both GMA 3 and GMA 7. In 2010, the DFC was adopted separately for GMA 3 and GMA 7.

Also, in 2010, the Dockum Aquifer was classified as not relevant for purposes of joint planning in Reagan County. In 2016, a DFC was been established for Reagan County.

Other areas of GMA 7 (specifically Ector, Midland, Mitchell, Nolan, Scurry, and Upton counties) had DFCs in 2010, and are now classified as not relevant for purposes of joint planning. The new model was released in preliminary form in the spring of 2015, and comments were submitted prior to finalizing the model and its report in August 2015.

Appendix D of the final report of the numerical model included comments and responses to the draft model. In summary, some changes were made to the aquifer parameters in Mitchell County, but only to make the numerical model consistent with the previously released conceptual model. No changes were made to recharge in the final model, which means that recharge is assumed constant every year (no variation with variation in precipitation). The assumed constant recharge was also deemed consistent with the conceptual model.

On pages D-26 and D-27 of the final report, the basis for the assumed constant recharge is summarized. Essentially, the Bureau of Economic Geology completed an analysis of the entire model area, which was focused on the Ogallala region in the panhandle region of Texas, and concluded that rises in groundwater levels are due to “post development-recharge rates” that are different due to changed land use conditions, not precipitation.

On page D-28, in response to comments about the model’s calibration, there is a response that acknowledges that some groundwater level recoveries are not simulated by the model. However, the authors of the report state that simulation of those recoveries would require a “point-calibration” to pumping or recharge, and state that such an effort would not improve the confidence in the model or improve its predictive capability. Based on these statements, the authors were focused on the regional aspects of the model only. While the calibration of the model is within industry standards, and may be useful for regional simulations of the Ogallala Aquifer over the entire areas of the model domain, it is not suitable to simulate conditions in the eastern areas of the Dockum, especially Mitchell and Nolan counties.

In general, the classification of portions of an aquifer as not relevant for purposes of joint planning are made when the area of an aquifer is small, when uses are insignificant, or where the management and regulation of groundwater in one GCD would not affect neighboring GCDs. Another way to view joint planning is that DFCs should be set only for those areas where impacts of pumping would cross GCD boundaries.

From a regional perspective, the HPAS is an adequate model (as defined by the TWDB through its acceptance of the model). Based on model results, pumping in Mitchell County and Nolan County does not impact surrounding counties. Given the lack of interaction between counties, the Dockum Aquifer has been classified as not relevant for purposes of joint planning in these counties.

2.4 Third Round Desired Future Conditions

After review and discussion, the groundwater conservation districts in Groundwater Management Area 7 found that the desired future conditions approved in 2016 would remain unchanged.

The resolution that documents the adoption of the desired future condition for the Capitan Reef Complex Aquifer is presented in Appendix A and was adopted on August 19, 2021 by a 14-0 vote at a properly noticed meeting of Groundwater Management Area 7.

3.0 Policy Justification

As developed more fully in this report, the proposed desired future condition was adopted after considering:

- Aquifer uses and conditions within Groundwater Management Area 7
- Water supply needs and water management strategies included in the 2012 State Water Plan
- Hydrologic conditions within Groundwater Management Area 7 including total estimated recoverable storage, average annual recharge, inflows, and discharge
- Other environmental impacts, including spring flow and other interactions between groundwater and surface water
- The impact on subsidence
- Socioeconomic impacts reasonably expected to occur
- The impact on the interests and rights in private property, including ownership and the rights of landowners and their lessees and assigns in Groundwater Management Area 7 in groundwater as recognized under Texas Water Code Section 36.002
- The feasibility of achieving the desired future condition
- Other information

In addition, the proposed desired future condition provides a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater in Groundwater Management Area 7.

There is no set formula or equation for calculating groundwater availability. This is because an estimate of groundwater availability requires the blending of policy and science. Given that the tools for scientific analysis (groundwater models) contain limitations and uncertainty, policy provides the guidance and defines the bounds that science can use to calculate groundwater availability.

As developed more fully below, many of these factors could only be considered on a qualitative level since the available tools to evaluate these impacts have limitations and uncertainty.

4.0 Technical Justification

The process of using the groundwater model in developing desired future conditions revolves around the concept of incorporating many of the elements of the nine factors (e.g. current uses and water management strategies in the regional plan). For the Dockum and Ogallala aquifers, 17 scenarios were completed, and the results discussed prior to adopting a desired future condition.

Some critics of the process asserted that the districts were "reverse-engineering" the desired future conditions by specifying pumping (e.g., the modeled available groundwater) and then adopting the resulting drawdown as the desired future condition. However, it must be remembered that among the input parameters for a predictive groundwater model run is pumping, and among the outputs of a predictive groundwater model run is drawdown. Thus, an iterative approach of running several predictive scenarios with models and then evaluating the results is a necessary (and time-consuming) step in the process of developing desired future conditions.

One part of the reverse-engineering critique of the process has been that "science" should be used in the development of desired future conditions. The critique plays on the unfortunate name of the groundwater models in Texas (Groundwater Availability Models) which could suggest that the models yield an availability number. This is simply a mischaracterization of how the models work (i.e. what is a model input and what is a model output).

The critique also relies on a fairly narrow definition of the term *science* and fails to recognize that the adoption of a desired future condition is primarily a policy decision. The call to use science in the development of desired future conditions seems to equate the term *science* with the terms *facts* and *truth*. Although the Latin origin of the word means knowledge, the term *science* also refers to the application of the scientific method. The scientific method is discussed in many textbooks and can be viewed as a means to quantify cause-and-effect relationships and to make useful predictions.

In the case of groundwater management, the scientific method can be used to understand the relationship between groundwater pumping and drawdown, or groundwater pumping and spring flow. A groundwater model is a tool that can be used to run "experiments" to better understand the cause-and-effect relationships within a groundwater system as they relate to groundwater management.

Much of the consideration of the nine statutory factors involves understanding the effects or the impacts of a desired future condition (e.g. groundwater-surface water interaction and property rights). The use of the models in this manner in evaluating the impacts of alternative futures is an effective means of developing information for the groundwater conservation districts as they develop desired future conditions.

5.0 Factor Consideration

Senate Bill 660, adopted by the legislature in 2011, changed the process by which groundwater conservation districts within a groundwater management area develop and adopt desired future conditions. The new process includes nine steps as presented below:

- The groundwater conservation districts within a groundwater management area consider nine factors outlined in the statute.
- The groundwater conservation districts adopt a "proposed" desired future condition
- The "proposed" desired future condition is sent to each groundwater conservation district for a 90-day comment period, which includes a public hearing by each district
- After the comment period, each district compiles a summary report that summarizes the relevant comments and includes suggested revisions. This summary report is then submitted to the groundwater management area.
- The groundwater management area then meets to vote on a desired future condition.
- The groundwater management area prepares an "explanatory report".
- The desired future condition resolution and the explanatory report are then submitted to the Texas Water Development Board and the groundwater conservation districts within the groundwater management area.
- Districts then adopt desired future conditions that apply to that district.

The nine factors that must be considered before adopting a proposed desired future condition are:

1. Aquifer uses or conditions within the management area, including conditions that differ substantially from one geographic area to another.
2. The water supply needs and water management strategies included in the state water plan.
3. Hydrological conditions, including for each aquifer in the management area the total estimated recoverable storage as provided by the executive administrator (of the Texas Water Development Board), and the average annual recharge, inflows and discharge.
4. Other environmental impacts, including impacts on spring flow and other interactions between groundwater and surface water.
5. The impact on subsidence.
6. Socioeconomic impacts reasonably expected to occur.
7. The impact on the interests and rights in private property, including ownership and the rights of management area landowners and their lessees and assigns in groundwater as recognized under Section 36.002 (of the Texas Water Code).
8. The feasibility of achieving the desired future condition.
9. Any other information relevant to the specific desired future condition.

In addition to these nine factors, statute requires that the desired future condition provide a balance between the highest practicable level of groundwater production and the conservation, preservation, protection, recharging, and prevention of waste of groundwater and control of subsidence in the management area.

5.1 Groundwater Demands and Uses

County-level groundwater demands and uses from 2000 to 2012 for the Dockum Aquifer are presented in Appendix B. County-level groundwater demands and uses from 2000 to 2012 for the Ogallala Aquifer are presented in Appendix C. Data were obtained from the Texas Water Development Board historic pumping database:

http://www.twdb.state.tx.us/waterplanning/waterusesurvey/historical-pumpage.asp

These data, and a comparison to current modeled available groundwater numbers were discussed at the GMA 7 meeting of December 18, 2014 in San Angelo, Texas.

5.2 Groundwater Supply Needs and Strategies

The 2016 Region F Plan lists county-by-county shortages and strategies. Shortages are identified when current supplies (e.g. existing wells) cannot meet future demands. Strategies are then recommended (e.g. new wells) to meet the future demands. No strategies are listed for the Ogallala or Dockum aquifers in GMA 7.

5.3 Hydrologic Conditions, including Total Estimated Recoverable Storage

The groundwater budget for the GMA 7 portion of the Dockum Aquifer for the calibration period of the HPAS (1929 to 2012) is presented in Table 1 along with the groundwater budget for the predictive period (2013 to 2070) under Scenario 17, the basis for the adopted desired future condition.

Table 1. Groundwater Budget for the GMA 7 Portion of the Dockum Aquifer

Inflow	1929 to 2012 Average (AF/yr)	2013 to 2070 Average (AF/yr)
Recharge from Precipitation	21,012	27,986
Inflow from Overlying Formations	5,645	7,026
Inflow from GMA 2	640	674
Total Inflow	27,297	35,686
Outflow		
Pumping	8,478	35,724
Spring Flow	3,125	3,597
Outflow to Surface Water and Boundary Outflow	11,359	11,883
Evapotranspiration	4,961	5,846
Outflow to GMA 3	1,838	1,389
Outflow to GMA 6	342	323
Total Outflow	30,104	58,761
Inflow - Outflow	-2,807	-23,075
Model Estimated Storage Change	-2,807	-23,075
Model Error	0	0

The groundwater budget for the GMA 7 portion of the Ogallala Aquifer for the calibration period of the HPAS (1929 to 2012) is presented in Table 2 along with the groundwater budget for the predictive period (2013 to 2070) under Scenario 10, the basis for the adopted desired future condition.

Table 2. Groundwater Budget for the GMA 7 Portion of the Ogallala Aquifer

Inflow	1929 to 2012 Average (AF/yr)	2013 to 2070 Average (AF/yr)
Recharge from Precipitation	3,555	7,670
Inflow from GMA 2	1,750	2,432
Inflow from Surface Water and Boundary Outflow	N/A	1,621
Total Inflow	5,305	11,723
Outflow		
Pumping	16,447	22,585
Spring Flow	617	528
Outflow to Surface Water and Boundary Outflow	34,205	N/A
Evapotranspiration	2,538	1,371
Outflow to GMA 3	1,855	986
Outflow to GMA 6	20	20
Outflow to Underlying Formations	5,645	7,026
Total Outflow	61,327	32,516
Inflow - Outflow	-56,021	-20,793
Model Estimated Storage Change	-56,021	-20,793
Model Error	0	0

Table 3 presents the total estimated recoverable storage for the GMA 7 portion of the Dockum Aquifer. Table 4 presents the total estimated recoverable storage for the GMA 7 portion of the Ogallala Aquifer.

Table 3. Total Estimated Recoverable Storage - Dockum Aquifer

County	Total Storage (acre-feet)	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Coke	520,000	130,000	390,000
Crockett	14,000,000	3,500,000	10,500,000
Ector	100,000,000	25,000,000	75,000,000
Glasscock	11,000,000	2,750,000	8,250,000
Irion	9,100,000	2,275,000	6,825,000
Midland	10,000,000	2,500,000	7,500,000
Mitchell	27,000,000	6,750,000	20,250,000
Nolan	2,100,000	525,000	1,575,000
Pecos	2,500,000	625,000	1,875,000
Reagan	17,000,000	4,250,000	12,750,000
Scurry	32,000,000	8,000,000	24,000,000
Sterling	33,000,000	8,250,000	24,750,000
Tom Green	1,100,000	275,000	825,000
Upton	9,300,000	2,325,000	6,975,000
Total	268,620,000	67,155,000	201,465,000

Table 4. Total Estimated Recoverable Storage - Ogallala Aquifer

County	Total Storage (acre-feet)	25 percent of Total Storage (acre-feet)	75 percent of Total Storage (acre-feet)
Ector	840,000	210,000	630,000
Glasscock	2,000,000	500,000	1,500,000
Midland	3,500,000	875,000	2,625,000
Total	6,340,000	1,585,000	4,755,000

5.4 Other Environmental Impacts, including Impacts on Spring Flow and Surface Water

Tables 1 and 2 above includes groundwater budget estimates of spring flow and surface water interactions with groundwater for the Dockum and Ogallala aquifers as estimated by the HPAS GAM.

5.5 Subsidence

Subsidence is not an issue in the Dockum and Ogallala aquifers in GMA 7. Applying the maximum drawdown to the recently released subsidence tool on the Texas Water Development board website, the Total Weighted Risk for the Ogallala Aquifer is 5.00 and is 3.75 for the Dockum Aquifer. As noted in the tool, a risk score of 0 is low risk and a risk score of 10 is high risk. Predicted subsidence using the tool is 0.06 feet for the Dockum Aquifer and 0.00 feet for the Ogallala Aquifer from 2010 to 2070.

5.6 Socioeconomic Impacts

The Texas Water Development Board prepared reports on the socioeconomic impacts of not meeting water needs for each of the Regional Planning Groups during development of the 2021 Regional Water Plans. Because the development of this desired future condition used the State Water Plan demands and water management strategies as an important foundation, it is reasonable to conclude that the socioeconomic impacts associated with this proposed desired future condition can be evaluated in the context of not meeting the listed water management strategies. Groundwater Management Area 7 is covered by Regional Planning Group F. The socioeconomic impact report for Regions F is included in Appendix D.

5.7 Impact on Private Property Rights

The impact on the interests and rights in private property, including ownership and the rights of landowners and their lessees and assigns in Groundwater Management Area 3 in groundwater is recognized under Texas Water Code Section 36.002.

The desired future conditions adopted by GMA 7 are consistent with protecting property rights of landowners who are currently pumping groundwater and landowners who have chosen to conserve groundwater by not pumping. All current and projected uses (as defined in the 2015 Region F plan) can be met based on the simulations. In addition, the pumping associated with achieving the desired future condition (the modeled available groundwater) will cause impacts to exiting well owners and to surface water. However, as required by Chapter 36 of the Water Code, GMA 7 considered these impacts and balanced them with the increasing demand of water in the GMA 7 area, and concluded that, on balance and with appropriate monitoring and project specific review during the permitting process, the desired future condition is consistent with protection of private property rights.

5.8 Feasibility of Achieving the Desired Future Condition

Groundwater levels are routinely monitored by the districts and by the TWDB in GMA 7. Evaluating the monitoring data is a routine task for the districts, and the comparison of these data with the model results that were used to develop the DFCs is covered in each district's management plan. These comparisons will be useful to guide the update of the DFCs that are required every five years.

5.9 Other Information

GMA 7 did not consider any other information in developing the DFCs.

6.0 Discussion of Other Desired Future Conditions Considered

There were 16 GAM scenarios completed that included a range of future pumping scenarios that were based on historic use (Scenarios 1 to 15). After review of those results, GMA 7 representatives expressed a desire to evaluate a simulation based on pumping that was consistent with the current modeled available groundwater and included establishing a DFC in Reagan County. This scenario was labeled Scenario 17. Scenario 16 using the HPAS was used in simulations for GMA 2.

Results of the first 15 scenarios were presented and discussed at the GMA 7 meeting of January 14, 2016. Scenario 17 results were presented and discussed at the April 21, 2016 GMA 7 meeting. Results of all scenarios were summarized on Technical Memorandum 16-01.

7.0 Discussion of Other Recommendations

Public comments were invited, and each district held a public hearing on the proposed desired future condition for aquifers within their boundaries. Since the DFC for the Ogallala Aquifer was only established for Glasscock County, the Glasscock GCD is the only district that held a public hearing for this DFC. Since DFCs were only established for Pecos and Reagan counties, the only districts to hold public hearings were Middle Pecos GCD and Santa Rita GCD. Dates of the public hearings are summarized below:

Groundwater Conservation District	Date of Public Hearing	Number of Comments Received
Glasscock GCD	6/15/2021	None
Middle Pecos GCD	6/15/2021	None
Santa Rita UWCD	5/18/2021	None

8.0 References

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Hermitte, S.M., Backhouse S., Kalaswad, S., and Mace, R.E., 2015. Groundwater Availability in Texas: Comparing Estimates from the 2012 State Water Plan and Desired Future Conditions. Texas Water Development Board Technical Note 15-05. August 2015, 102p.

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Jones, I.C., Bradley, R., Boghici, R., Kohlrenken, W., Shi, J., 2013. GAM Task 13-030: Total Estimated Recoverable Storage for Aquifers in Groundwater Management Area 7. Texas Water Development Board, Groundwater Resources Division, October 2, 2013, 53 p.