

GTA Aquifer Assessment 10-07 MAG
Groundwater Management Area 10
Leona Gravel Aquifer
Draft Managed Available Groundwater estimates
November 9, 2010

GTA Aquifer Assessment 10-07 MAG

by **Robert G. Bradley**

Texas Water Development Board
Groundwater Technical Assistance Section
(512) 936-0871

This document is released for the purpose of interim review under the authority of Robert G. Bradley, P.G. 707 on November 9, 2010.

EXECUTIVE SUMMARY:

The estimated total pumping from the Leona Gravel Aquifer within Medina County that achieves the desired future condition adopted by members of Groundwater Management Area 10 is approximately 16,382 acre-feet per year and is summarized by county, regional water planning area, and river basin as shown in Tables 1. The estimated managed available groundwater for the groundwater conservation districts within Groundwater Management Area 10 for the aquifer declines from approximately 16,122 acre-feet per year to 15,858 acre-feet per year between 2010 and 2060 as shown in Table 4. The total pumping estimates were extracted from GTA Aquifer Assessment 09-01, which Groundwater Management Area 10 used as the basis for developing a desired future condition.

REQUESTOR:

Mr. Rick Illgner of the Edwards Aquifer Authority acting on behalf of the member groundwater conservation districts of Groundwater Management Area 10.

DESCRIPTION OF REQUEST:

In a letter received August 11, 2010, Mr. Rick Illgner provided the Texas Water Development Board (TWDB) with the desired future condition of Leona Gravel Aquifer within Medina County, adopted by the members of Groundwater Management Area 10. The desired future condition for the Leona Gravel Aquifer, as described in Resolution No. 2010-01 and adopted May 17, 2010 by the groundwater conservation districts in Groundwater Management Area 10 is summarized below:

An average annual drawdown of 15 feet over the next 50 years.

In response to receiving the adopted desired future condition, TWDB has estimated the managed available groundwater that achieves the above desired future condition for Groundwater Management Area 10.

METHODS:

Groundwater Management Area 10, located in South Central Texas, includes part of the Leona Gravel Aquifer (Figure 1). This is neither a major nor a minor aquifer, but has been determined to be locally relevant for joint planning purposes. At the request of Groundwater Management Area 10, the TWDB previously analyzed several water level decline scenarios for the Leona Gravel Aquifer, documented in GTA Aquifer Assessment 09-01.

One of the scenarios included the desired future condition of 15 feet of water level decline, and this was adopted as the desired future condition of the Leona Gravel Aquifer within Medina County for GMA 10.

The total pumping numbers are divided by regional water planning area and river basin. Medina County is completely within the South Central Regional Water Planning Area and the Medina County Groundwater Conservation District encompasses the whole county. Regional maps of these areas are shown in Figure 2.

PARAMETERS AND ASSUMPTIONS:

- Parameters, assumptions, volumetric calculations, and areas were obtained from GTA Aquifer Assessment 09-01 (George, 2010).
- Water-level declines of 15 feet were estimated to be uniform across the aquifer.

DETERMINING MANAGED AVAILABLE GROUNDWATER:

As defined in Chapter 36 of the Texas Water Code, “managed available groundwater” is the amount of water that may be permitted by a groundwater conservation district. The estimated total annual volume of groundwater calculated, however, represents the total amount of pumping from the aquifer. The total pumping includes uses of water both subject to permitting and exempt from permitting. Examples of exempt uses include domestic, livestock, and oil and gas exploration. Each district may also exempt additional uses as defined by its rules or enabling legislation.

Because exempt uses are not available for permitting, it is necessary to account for them when determining managed available groundwater. To do this the Texas Water Development Board developed a standardized method for estimating exempt use for domestic and livestock purposes based on projected changes in population and the ratio of domestic and livestock wells in an area to the total number of wells. Because other exempt uses can vary significantly from district to district and there is much higher uncertainty associated with estimating use due to oil and gas exploration, estimates of exempt pumping outside domestic and livestock uses have not been included. If a district believes it has a more appropriate estimate of exempt pumping, they may submit it, along with a description of how it was developed, to the Texas Water Development Board for consideration. Once established, the estimates of exempt pumping are subtracted from the total pumping calculation to yield the estimated managed available groundwater for permitting purposes.

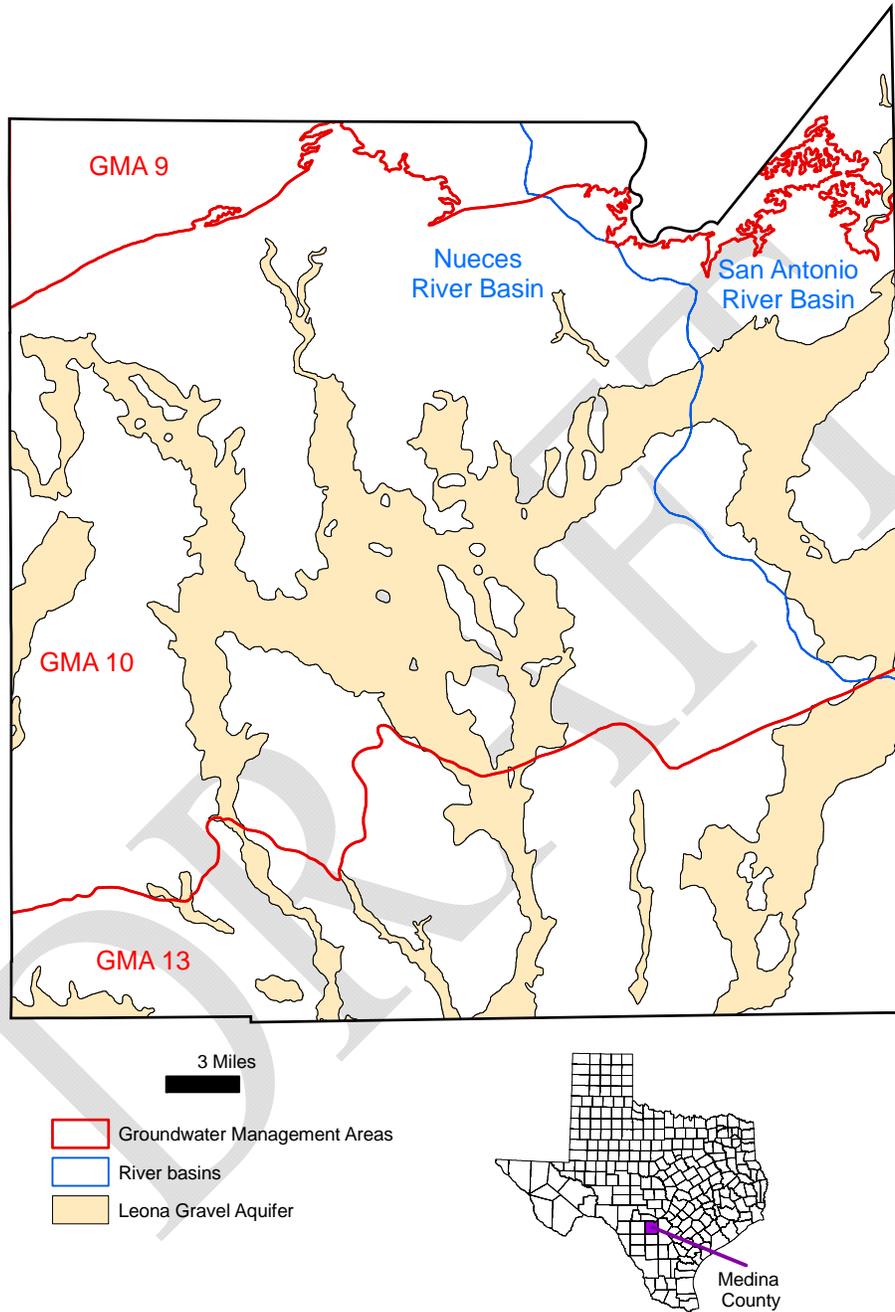


Figure 1. Map showing the groundwater management areas, river basins, and extent of the Leona Gravel Aquifer in Medina County (after George, 2010).

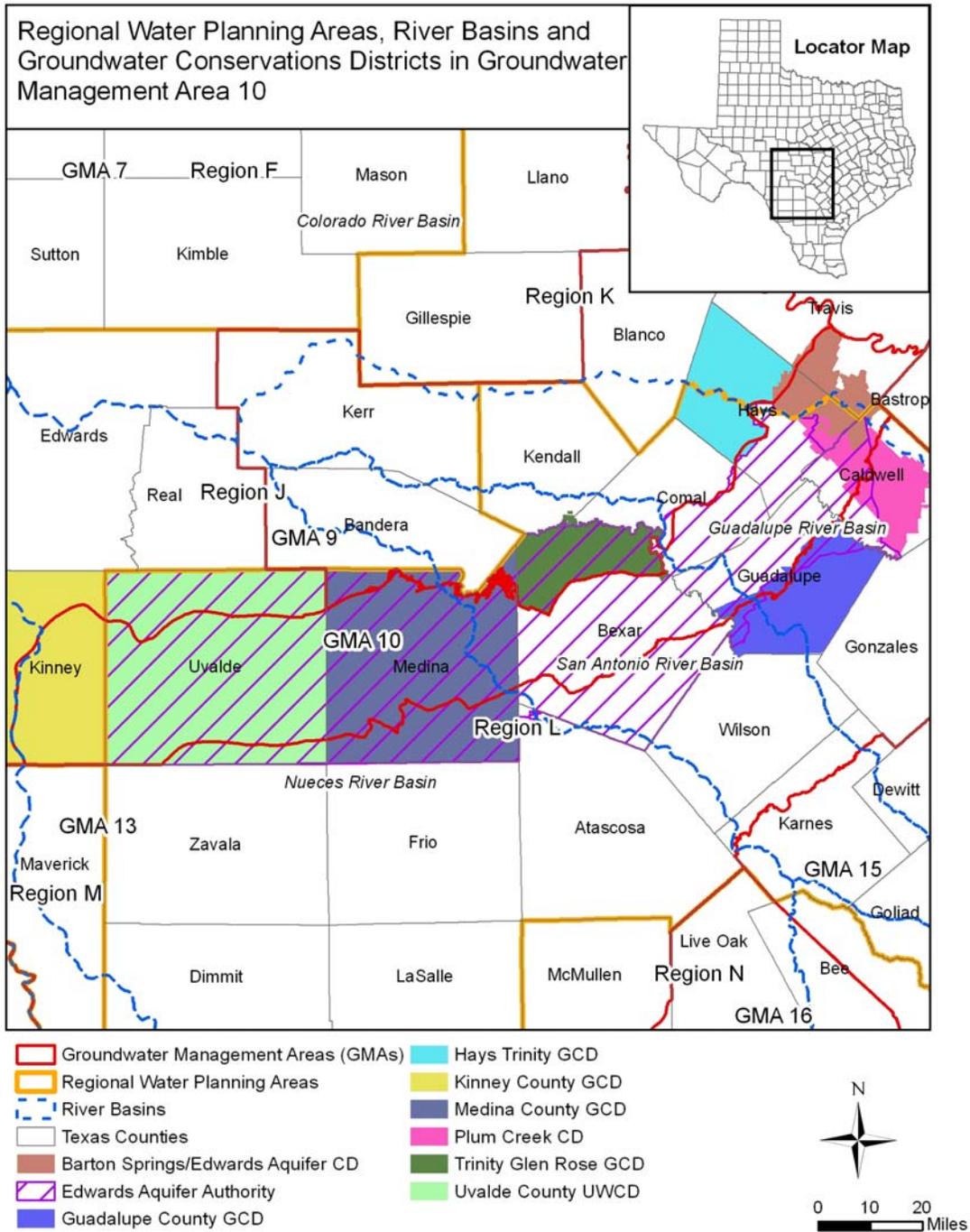


Figure 2. Map showing regional water planning areas, river basins, groundwater conservation districts, and counties in and neighboring Groundwater Management Area 10 (from Thorkildsen and Backhouse, 2010).
 CD = Conservation District, GCD = Groundwater Conservation District, UWCD = Underground Water Conservation District

RESULTS:

The estimated total pumping from the Leona Gravel Aquifer within Medina County in Groundwater Management Area 10 that achieves the adopted desired future condition is approximately 16,382 acre-feet per year. This pumping has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 1). In addition, the total pumping estimates are summarized by county in Table 2.

Table 3 contains the estimates of exempt pumping for the Medina County GCD within Groundwater Management Area 10 for domestic and livestock uses. The managed available groundwater for the groundwater conservation district is the difference between the total pumping within the district (Table 2) and the estimated exempt use (Table 3) and is shown in Table 4.

Table 1. Estimated total pumping by decade for the Leona Gravel Aquifer in Groundwater Management Area 10. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Medina	L	Nueces	12,369	12,369	12,369	12,369	12,369	12,369
		San Antonio	4,013	4,013	4,013	4,013	4,013	4,013
Total			16,382	16,382	16,382	16,382	16,382	16,382

Table 2. Estimated total pumping for the Leona Gravel Aquifer summarized for Medina County in Groundwater Management Area 10 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Medina	16,382	16,382	16,382	16,382	16,382	16,382

Table 3. Estimates of exempt use for the Leona Gravel Aquifer in Groundwater Management Area 10 for the Medina County GCD for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Source	Year					
		2010	2020	2030	2040	2050	2060
Medina County GCD	T	260	323	380	431	480	524

T = Estimated exempt use calculated by TWDB

GCD = Groundwater Conservation District

Table 4. Estimates of managed available groundwater for the Leona Gravel Aquifer in Groundwater Management Area 10 by groundwater conservation district for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Medina County GCD	16,122	16,059	16,002	15,951	15,902	15,858

GCD = Groundwater Conservation District

Limitations:

As indicated by George (2010), additional data are needed to create improved estimates; these estimates are a basic interpretation of the requested conditions. This analysis assumes homogeneous and isotropic aquifers; however, conditions for the Leona Gravel Aquifer may not behave in a uniform manner. There is uncertainty with respect to the distribution of the sand and gravel in the aquifer (Lowry and Couch, 2002; Green, 2003). The analysis further assumes that precipitation is the only source of aquifer recharge and that lateral inflow to the aquifer is equal to lateral outflow from the aquifer, and that future pumping will not alter this balance.

Discharge and recharge from other aquifers, such as the Edwards BFZ aquifer, are unknown as is recharge from streams. Discharge to streams from the Leona Gravel Aquifer is assumed to be 15,000 acre-feet per year (George, 2010), but this number needs to be investigated with gain-loss streamflow assessment research. The recharge rate is also a rough estimate as is the specific yield.

Note that estimates of managed available groundwater are based on the best available scientific tools that can be used to develop managed available groundwater and that these estimates can be a function of assumptions made on the magnitude and distribution of pumping in the aquifer. Therefore, it is important for groundwater conservation districts to monitor whether or not they are achieving their desired future conditions and to work with the TWDB to refine managed available groundwater given the reality of how the aquifer responds to the actual magnitude and distribution of pumping now and in the future.

REFERENCES:

George, P., 2010, GTA Aquifer Assessment 09-01: Texas Water Development Board, GTA Aquifer Assessment Report 09-01 Report, 14 p.

Green, R.T., 2003, Geophysical survey to determine the depth and lateral extent of the Leona Aquifer in the Leona river floodplain, south of Uvalde, Texas: Prepared for the Edwards Aquifer Authority by the Southwest Research Institute, 21 p.

Lowry, M.V., and Couch, B. E., 2002, Phase I Leona Gravel Aquifer Study: Prepared for the Medina County Groundwater Conservation District by Turner Collie & Braden Inc., 51 p.

Thorkildsen D. and Backhouse S., 2010, GTA Aquifer Assessment 10-29: Texas Water Development Board, GTA Aquifer Assessment 10-29 Report, 11 p.

DRAFT