Aquifer Assessment 10-41: Aquifer Assessment for the Leona Gravel Aquifer in Groundwater Management Area 13

by Robert G. Bradley, P.G.
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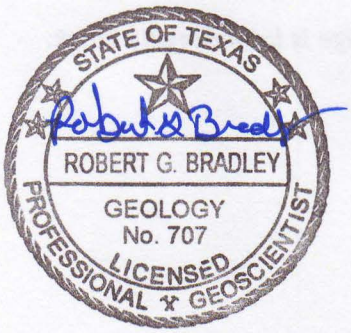
(512) 936-0870
August 20, 2012



Robert G. Bradley, P.G. 707, authorized the seal appearing on this document on August 20, 2012.

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EXECUTIVE SUMMARY:

This report summarizes the final modeled available groundwater as calculated by George (2010) for the Leona Gravel Aquifer in Medina County that lies within Groundwater Management Area 13. The estimated modeled available groundwater from the Leona Gravel Aquifer within Medina County that achieves the desired future condition adopted by members of Groundwater Management Area 13 is approximately 5,635 acre-feet per year and is summarized by county, regional water planning area, and river basin as shown in Table 1.

REQUESTOR:

Ms. Luanna Buckner of the Medina County Groundwater Conservation District acting on behalf of Groundwater Management Area 13.

DESCRIPTION OF REQUEST:

In a letter received July 22, 2011, Ms. Luana Buckner 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 13. The desired future condition for the Leona Gravel Aquifer, as described in Resolution No. 2011-01 and adopted July 13, 2011 by the groundwater conservation districts in Groundwater Management Area 13 is summarized as an average drawdown of 15 feet for the Leona Gravel Aquifer in Medina County.

METHODS:

Groundwater Management Area 13, 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 13, the TWDB previously analyzed several water level decline scenarios for the Leona Gravel Aquifer, documented in GTA Aquifer Assessment 09-01 (George, 2010).

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 13.

The modeled available groundwater estimates 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). The water-level declines of 15 feet were estimated to be uniform across the aquifer.

RESULTS:

The estimated modeled available groundwater from the Leona Gravel Aquifer within Medina County in Groundwater Management Area 13 that achieves the adopted desired future condition is approximately 5,635 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 1. Modeled available groundwater by decade for the Leona Gravel Aquifer in groundwater management area 13. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Medina	L	Nueces	5,586	5,586	5,586	5,586	5,586	5,586
		San Antonio	49	49	49	49	49	49

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 (Balcones Fault Zone) 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 and specific yield estimates are rough approximations.

This analysis was determined to be the best method to calculate a modeled available groundwater estimate; however, this method has limitations and should be replaced with better tools, including groundwater models and additional data that are not currently available, whenever possible. This analysis assumes that the aquifer is in a state of dynamic equilibrium. This assumption needs to be considered and compared to actual future data when evaluating achievement of the desired future condition.

Given these limitations, users of this information are cautioned that the modeled available groundwater estimates should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping and water levels to know if they are achieving their desired future conditions. Because of the limitations and assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine these modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location 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., 2011, GTA Aquifer Assessment 10-26: Texas Water Development Board, GTA Aquifer Assessment 10-26 Report, 11 p.

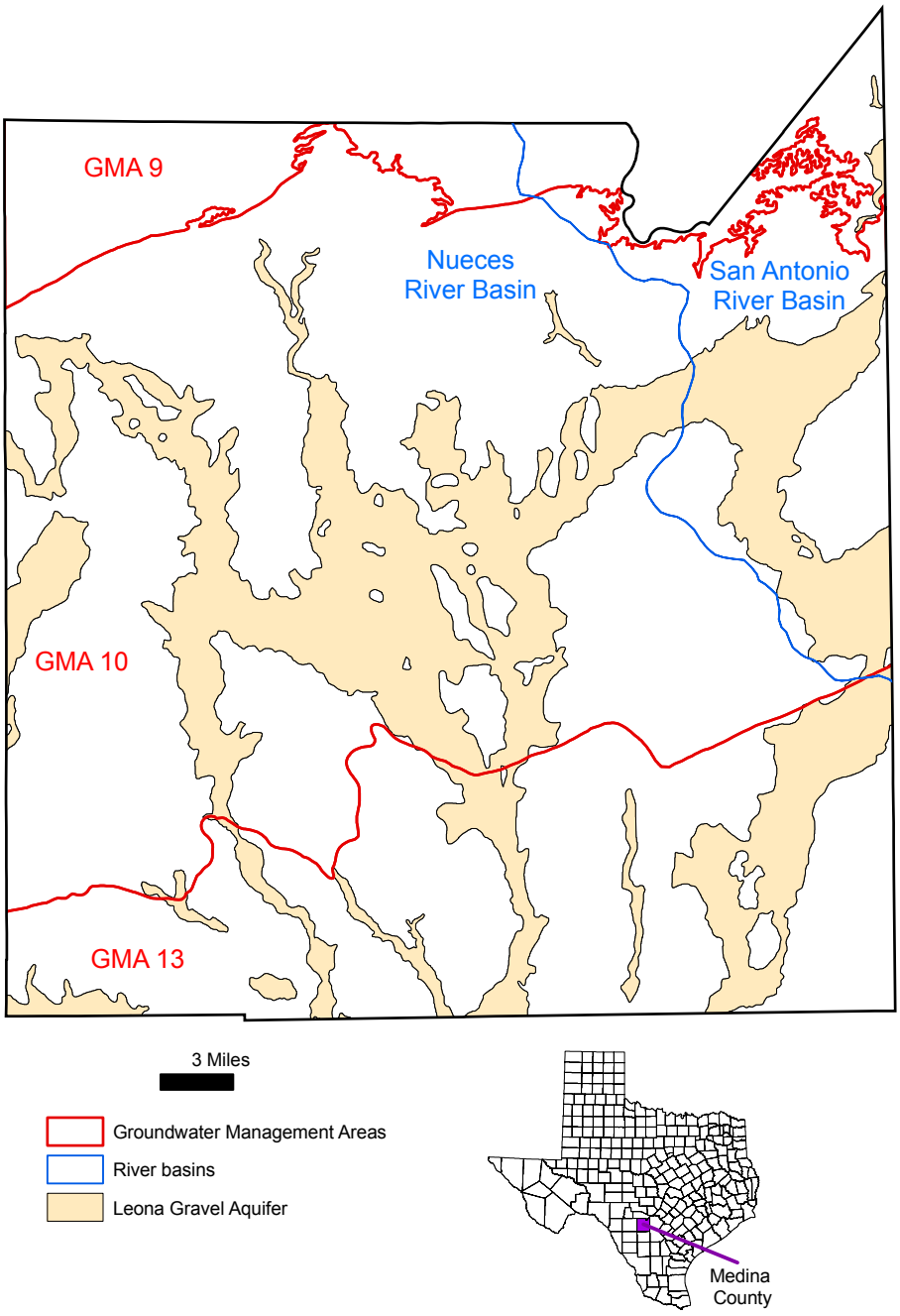

Figure 1. Map Showing the groundwater management areas, river basins, and extent of the Leona Gravel Aquifer in Medina County (After George, 2010).

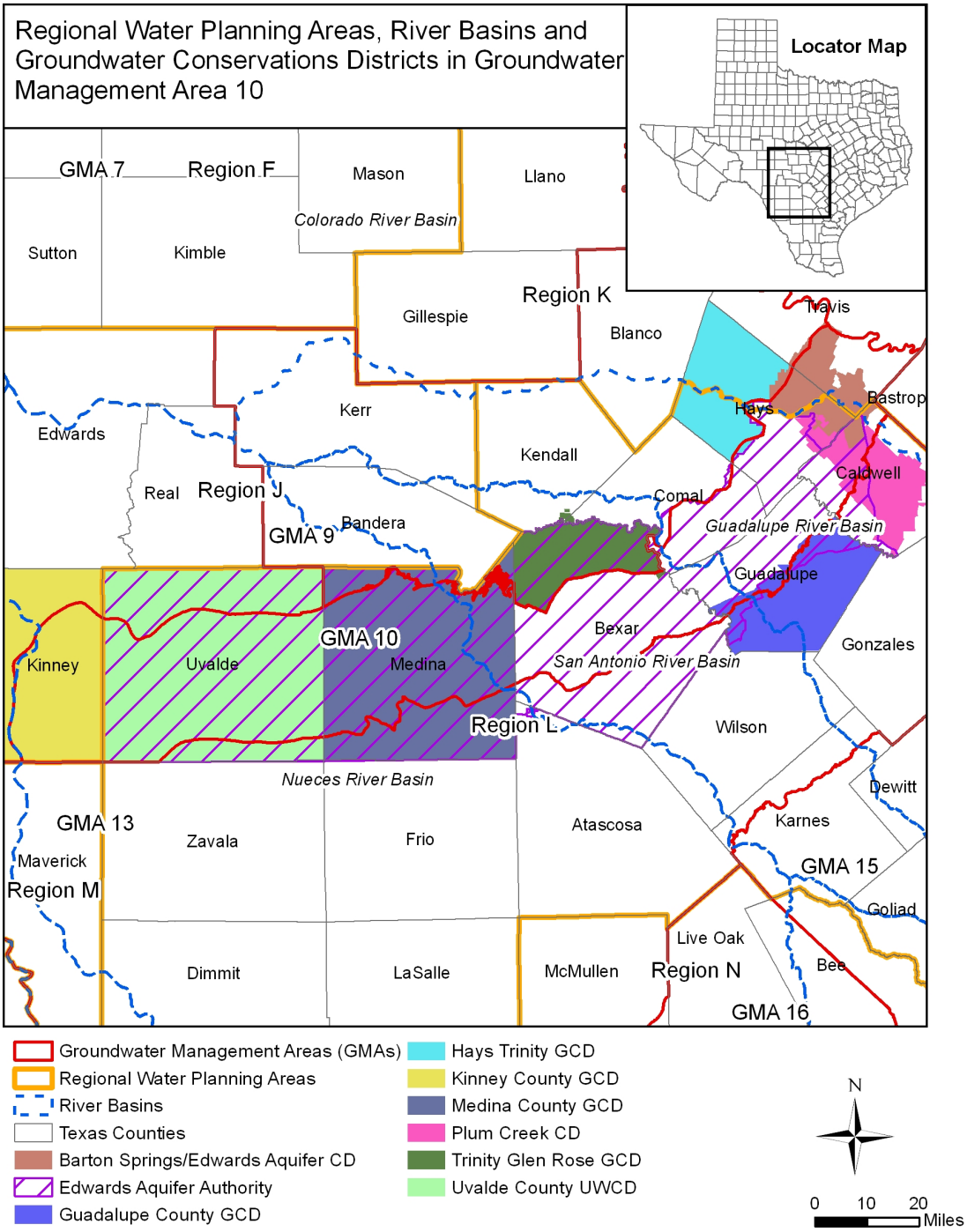

Figure 2. Map showing regional water planning areas, river basins, groundwater conservation districts, and counties in and neighboring groundwater management area 10 (from Thorkildsen and Backhouse, 2010).CD = conservation district, GCD = groundwater conservation district, UWCD = underground water conservation district