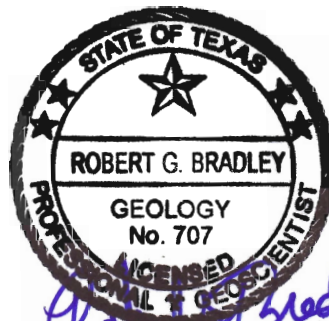


GTA Aquifer Assessment 10-04
Groundwater Management Area 7
Ellenburger-San Saba Aquifer
Draft total pumping estimates
September 10, 2010

GTA Aquifer Assessment 10-04

by Robert G. Bradley, P.G.

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



REQUESTOR:

Caroline Runge, of the Menard County Underground Water District acting on behalf of the member groundwater conservation districts of Groundwater Management Area 7.

DESCRIPTION OF REQUEST:

This is a re-evaluation based on data supplied by two groundwater conservation districts to update the results Aquifer Assessment 08-08 for the Ellenburger-San Saba Aquifer. The GCDs supplying supplemental data were the Hill Country Underground Water Conservation District (HCUWCD) and the Menard County Underground Water District (MCUWD).

DRAFT DESIRED FUTURE CONDITIONS:

- Ellenburger-San Saba Aquifer – Four scenarios that allow water-level declines of 5, 10, 15, and 20 feet after 50 years, respectively.

METHODS:

The HCUWCD (Tybor, 2010) and the MCUWD (Caroline Runge, personal communication, 2010) supplied additional data for the Ellenburger-San Saba Aquifer. HCUWCD supplied water-level data and water use data that indicates average water levels have remained steady for years 2005 – 2008. The average pumpage for these years was 3,851 acre-feet per year.

TWDB staff calculated a comparable estimate of 730 acre-feet per year of pumping, based on MCUWD information and the assertion of no noticeable water level declines in the district (Caroline Runge, personal communication, 2010).

A transient hydrologic budget for the saturated portion of an aquifer is (Freeze and Cherry, 1979, p.365):

$$Q(t) = R(t) - D(t) + \frac{dS}{dt}$$

Where: Q(t)= total rate of groundwater withdrawal
R(t)= total rate of groundwater recharge to the basin
D(t)= total rate of groundwater discharge from the basin

$$\frac{dS}{dt} = \text{rate of change of storage in the saturated zone of the basin}$$

Based on the updated GCD data, the average annual water levels have not varied significantly for the last five years. This infers that the aquifer is near equilibrium conditions, therefore dS/dt can be set zero to obtain,

$$Q(t) = R(t) - D(t).$$

Consequently, approximately 3,851 acre-feet per year may be pumped within HCUWD and 730 acre-feet per year can be pumped within the MCUWD without removing water from aquifer storage.

Previously in AA08-08 (Thorkildsen and Backhouse, 2010), the volume that could be pumped from the aquifer was estimated at 8,400 acre-feet per year within the HCUWD. Because of variation in the two methods, the estimated pumpage amounts for HCUWD were averaged to obtain a value of 6,127 acre-feet per year. There is no comparable estimate for the MCUWD in AA08-08, so 730 acre-feet per year as used modify the draft total pumping numbers for this report.

Table 1 recaps the estimated annual volumes from water level declines of 5, 10, 15 and 20 feet from AA 08-08 (Thorkildsen and Backhouse, 2010).

The calculations were completed in a Microsoft Excel worksheet.

PARAMETERS AND ASSUMPTIONS:

- Parameters, assumptions, volumetric calculations, and areas were obtained from Aquifer Assessment 08-08 (Thorkildsen and Backhouse, 2010).
- Water level declines of 5, 10, 15, and 20 feet, respectively, were estimated to be uniform across the aquifer.

RESULTS:

The re-evaluated total pumping for the Hill Country UWCD and Menard County UWD are summarized in Table 2 by groundwater conservation district and desired aquifer conditions.

Table 1. Summary of Estimated annual volume (acre-feet per year) from water level declines (Thorkildsen and Backhouse, 2010)

Groundwater Conservation District	5 ft. decline	10 ft. decline	15 ft. decline	20 ft. decline
Hill Country UWCD	144	287	431	574
Menard County UWD	13	26	38	51

UWCD = underground water conservation district

UWD = underground water district

Table 2. Summary total pumping (acre-feet per year) based on water-level declines of 5,10, 15, and 20 feet for the Ellenburger-San Saba Aquifer for the Hill Country UWCD and Menard County UWD.

Groundwater Conservation District	5 ft. decline	10 ft. decline	15 ft. decline	20 ft. decline
Hill Country UWCD	6,271	6,415	6,558	6,701
Menard County UWD	743	756	768	781

UWCD = underground water conservation district

UWD = underground water district

Limitations:

Additional data are needed to create improved estimates; these estimates are a fundamental interpretation of the requested conditions. This analysis assumes homogeneous and isotropic aquifers; however, conditions for the Ellenburger-San Saba Aquifer may not behave in a uniform manner. The analysis further assumes that precipitation is the only source of aquifer recharge, lateral inflow to the aquifer is equal to lateral outflow from the aquifer, and that future pumping will not alter this balance.

GTA Aquifer Assessment 10-04
Groundwater Management Area 7
Ellenburger-San Saba Aquifer
Draft total pumping estimates
September 10, 2010

REFERENCES:

Thorkildsen, D. and Backhouse, S., 2010, Draft Aquifer Assessment 08-08;
Texas Water Development Board unpublished report.

Tybor, P., 2010, Ellenburger and Hickory aquifers average water levels and
pumpage: Hill Country Underground Water Conservation District, 1 p.