Structural Cross-section of Dip Line Y
Salinity class and lithology interpretations for the Yegua, Sparta, Queen City, Carrizo, and Wilcox aquifers, Central Texas

The aquifers mapped by the Brackish Resources Aquifer Characterization System (BRACS) team at the Texas Water Development Board (TWDB) in Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas (Meyer and others, 2020) are the Wilcox, Carrizo, Queen City, Sparta, and Yegua aquifers (laid oldest to youngest). The team mapped these aquifers in all or parts of 14 counties (Atascosa, Bastrop, Bexar, Caldwell, DeWitt, Fayette, Gonzales, Guadalupe, Kerr, Lava, Lee, Live Oak, Williamson, and Wilson counties), five regional water planning areas (G, K, L, P, and N), and nine groundwater conservation districts.

BRACS studies provide Texas with an estimate of the location and quantity of brackish groundwater, as groundwater salinity is an important parameter for desalination. Groundwater salinity classes are mapped as fresh (0-999 mg/L TDS), slightly saline (1,000-2,999 mg/L TDS), moderately saline (3,000-9,999 mg/L TDS), very saline (10,000-34,999 mg/L TDS), brackish (greater than or equal to 35,000 mg/L TDS), or some combination of these classes (Winlow and Kater, 1996). The BRACS team accomplishes this goal by:

- mapping a stratigraphic framework from geophysical well logs,
- estimating saturated aquifer thickness using lithology interpreted from geophysical well logs and static water level,
- calculating total dissolved solids from geophysical well logs where no measured water quality samples exist,
- delineating the extent of salinity classes based on the measured and calculated total dissolved solids, and
- calculating an estimate of in place groundwater volume per aquifer salinity class.

For Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas, geophysical well logs were used to make 4,652 stratigraphic picks and 5,139 groundwater salinity calculations. More than 2,000 wells with geophysical well logs or driller’s descriptions assigned lithologic intervals (Figure 2). Data mining and aquifer determination yielded 3,662 measured water quality samples. All this data is integrated and provided the foundation to map and characterize the groundwater of the study area.

GIS database from this study, for example formation surface elevation and potentiometric surface interpretations, can be downloaded from the Texas Water Development Board’s website:

http://www.twdb.texas.gov/minerals/waterresources/studiesUCP/index.asp

In addition to the study report and GIS database, stratigraphic, lithologic, and salinity interpretations are saved in the BRACS Database. It may be downloaded with an accompanying data dictionary:


We conducted nine regional cross-sections, six strike-oriented and three dip-oriented (Figure 3). To illustrate the stratigraphy, lithology, and salinity interpretations for selected wells in the project, Structural Cross-section of Dip Line Y (Figure 1) was constructed from Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas data and interpretations stored in the BRACS Database. Each well on the line is labeled with the owner’s name and either the BRACS Database well ID (5-digit, alpha-numeric) or the Groundwater Database State Well Number (SWN 4-4-999). Well intervals are displayed in feet relative to mean sea level with a vertical exaggeration of 20x. Approximate ground surface is shown for illustrative purposes.

This dip-oriented line was selected to display the complexity of groundwater salinity class mapping variations in lithology in the aquifers of the study. This line traverses the middle third of the study, which is adjacent to the San Marcos Arch. Starting at Y and going to Y’, the first well (16378) displays fresh groundwater in the Wilcox Aquifer. This well does not have a geophysical well log. Additionally, the screened portion of this well is not known, so the measured water quality is assumed to represent the total depth. The next well in the cross-section (14466) displays an interval of slightly saline Wilcox Aquifer groundwater. This interpretation is based on total dissolved solids calculated from geophysical log values. As you progress southward along the line (toward Y’), notice how the Carrizo Aquifer is fresh for more of the study area than the other aquifers. This creates scenarios, for example in wells 15312, 39954, 9613, and 15312, where there is fresh Carrizo Aquifer groundwater bracketed by brackish Yegua and Carrizo aquifer groundwater. Finally, the five mapped aquifers are mapped as primarily very saline at the down-dip portion of Dip Line Y.

In addition to spatial variations in groundwater salinity, there are also differences in lithology. For example, the Sparta and Queen City formations appear to become less sandy the further down-dip you progress.

Additional information and cross-sections from Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas (Meyer and others, 2020) are available to download from the study’s webpage.

References

TWDB (Texas Water Development Board), 2019a, BRACS Database:
Texas Water Development Board.

TWDB (Texas Water Development Board), 2019b, Groundwater Database: Texas Water Development Board.