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Stratigraphic Evaluation of Trinity Aquifers in Hays and Western Travis County and Implications for Groundwater Availability

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Abstract

The Trinity Aquifers are very important groundwater resources in central Texas. However, they show signs of hydrologic stress and depletion in some areas. This study focused on detailed stratigraphic evaluations to better understand hydrologic variations in the Trinity Aquifer system. The study consisted of seven wells located throughout the Western Travis and Northern Hays County area spanning 1800 square miles. All the wells had cuttings and geophysical logs. Two of the wells are multiport monitor wells providing detailed hydrologic data. Geophysical logs, cuttings, thin sections (where available), and outcrop descriptions were compiled, integrated and correlated. Stratigraphic cross sections were constructed and hydrologic data for the wells were plotted and compared to geologic data.

Results suggest that there are stratigraphic variations in the Middle and Lower Trinity units that may influence groundwater availability. From stratigraphic top to bottom, the Upper Glen Rose is a regionally consistent carbonate interval. The Middle Trinity Aquifer is composed of the Lower Glen Rose, Hensel and Cow Creek limestone. The discontinuous nature of the biostrome/reef intervals in the Lower Glen Rose appears to correlate to poor water quality and poor yield where the reef is absent. The Hensel, which transitions from a predominantly clastic and water bearing interval in the updip areas, to a thinner silty, dolomitic aquitard interval downdip. The underlying Cow Creek indicates a facies transition from an updip grainstone to dolomite in the downdip areas with higher yields. The underlying Hammett is a regionally consistent clay and aquitard unit for the Middle Trinity.

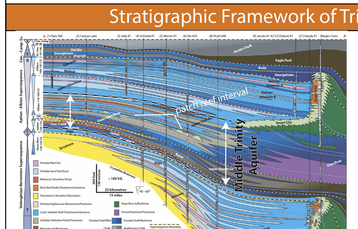
In addition to high levels of pumping, groundwater availability appears to be influenced by facies changes within the Middle Trinity units of the study area. Understanding the detailed stratigraphy will provide insights into these important groundwater resources.

Introduction/Purpose of Study

The Trinity Aquifer is a very important water resource for Central Texas. Evidence of studies show an increase of stress on aquifers in Central Texas. Stratigraphic information on the Middle/Lower Trinity is limited, so the purpose of this study is to add information to the Trinity Atlas.

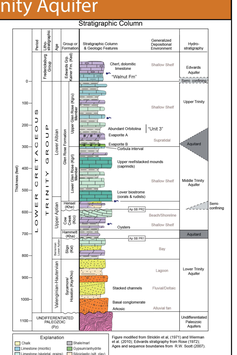
This study provides descriptions and characterizations of lithological units, including thin section and core cutting identification, and geophysical logs of several Central Texas wells. These stratigraphic sections help understand correlations between hydrology (aquifer resources and aquifer stresses) and geology of Trinity Aquifer units.

Stratigraphic Framework of Trinity Aquifer

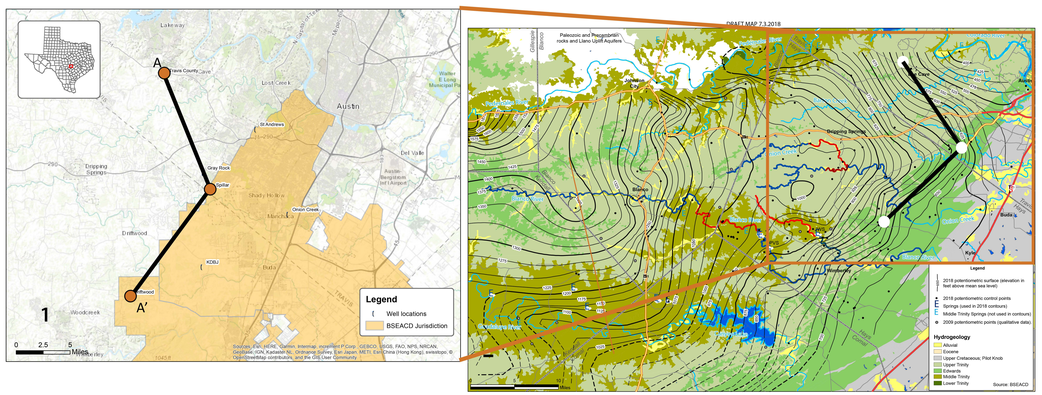


The Middle Trinity Aquifer is composed of (from stratigraphically lowest to highest) the Cow Creek, Hensel, and the Lower Glen Rose Formations. It is the primary aquifer in the Trinity Aquifer system for water-supply needs in the Hill Country.

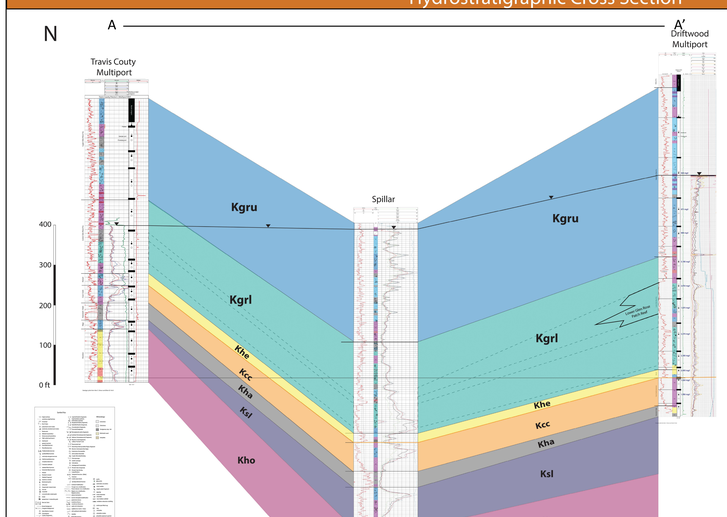
From updip areas to downdip areas, the Cow Creek transitions from a grainstone to a dolomite with higher water yields. The Hensel transitions from a water-bearing, clastic interval to a silty dolomitic aquitard. The Lower Glen Rose is compromised of a patch reef interval.



Study Area



Hydrostratigraphic Cross Section



Explanation

Cross section analysis from Western Travis County to Northern Hays County Spanning 20 miles shows a general increase in water table elevation going from updip (A) to downdip (A').

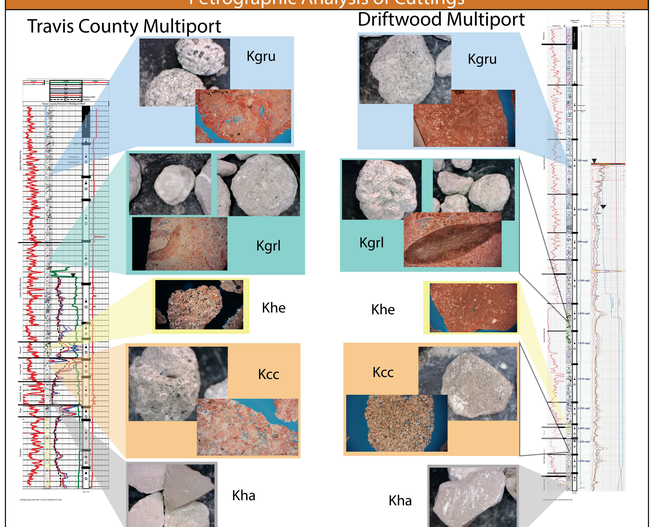
The small increase in the water table from Travis County to Spillar wells is due to the non-linearity of the cross section with respect to potentiometric surface elevation.

Data the cross section shows large variation in stratigraphy. From the Travis County Multiport Well (A) to Driftwood Multiport well in the South (A'), the Cow Creek transitions from a grainstone to a dolomite with higher water yields. The Hensel transitions from a water-bearing, clastic interval to a silty dolomitic aquitard.

The Lower Glen Rose is compromised of a patch reef interval. Data shows that this discontinuous nature of the biostrome/reef intervals correlates to poor water quality and poor yield where reefs are absent.

- Upper Glen Rose
- Lower Glen Rose
- Hensel Sand
- Cow Creek Limestone
- Hammett Shale
- Sligo
- Hoston
- Water Table

Petrographic Analysis of Cuttings



Conclusions

The analysis of the detailed stratigraphy of the Trinity Aquifer is important to understand the hydrological state of the Middle/Lower Trinity Aquifers.

Results suggest that stratigraphic variations in the Middle and Lower Trinity units do influence groundwater availability. There is a general rise in the water table elevation going downdip.

In the Lower Glen Rose, the development of patch reef intervals correlates to better water quality and yield where the reef is present. The Hensel, which transitions from a leaky, clastic, water bearing interval to a silty, dolomitic aquitard interval could also play a role in water storage. The underlying Cow Creek indicates a facies transition from a grainstone to dolomite, which indicates higher yields downdip from Travis County.

References

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