

GBRA ASR Aquifer Characterization

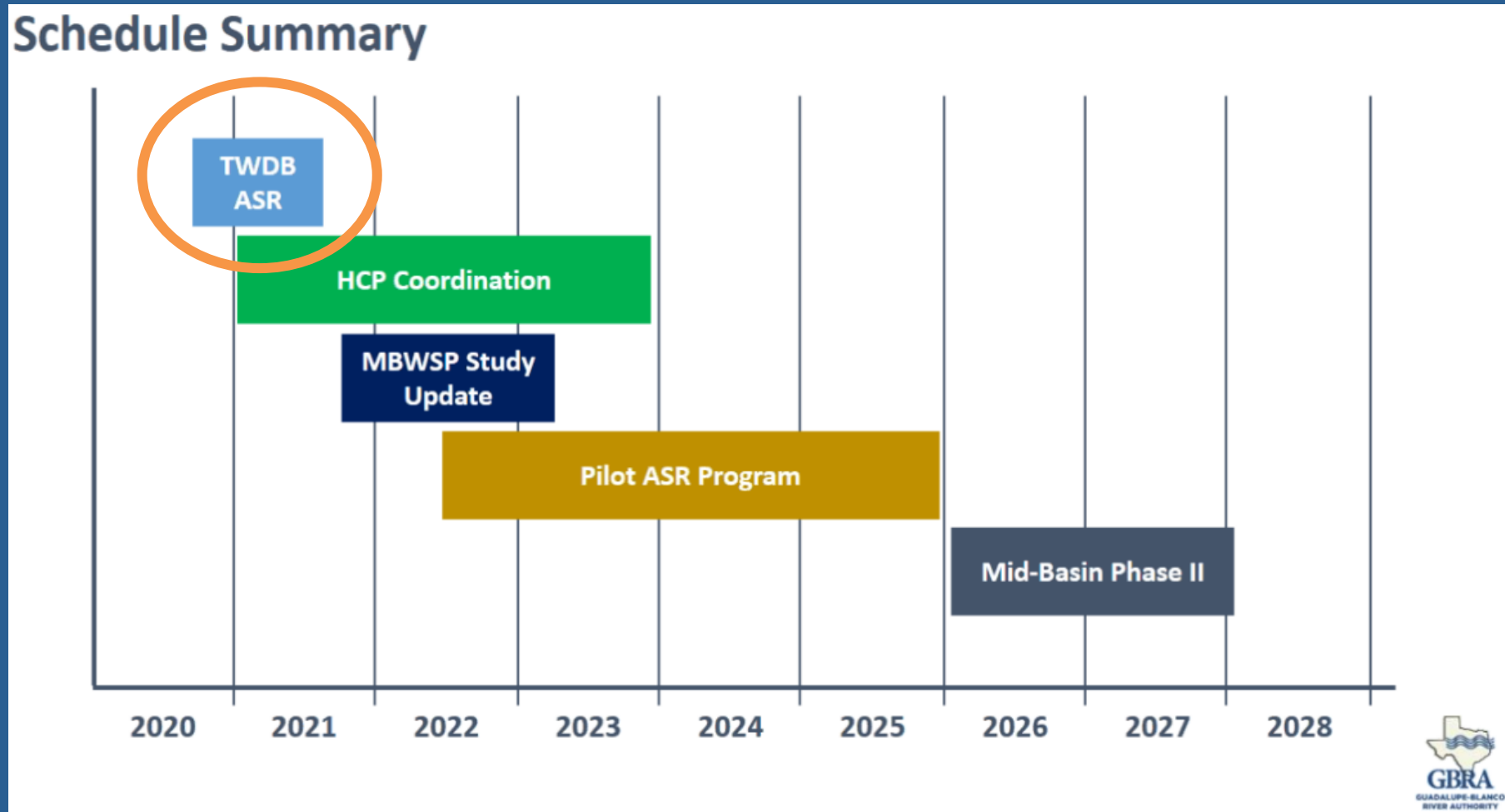
Study Update
April 14, 2021

Introductions

- GBRA staff
 - Brian Perkins
 - others
- TWDB Staff
 - Erika Mancha (manager)
 - Andrea Croskrey, P.G. (ASR discipline lead)
 - Daniel Collazo (Hydrogeologist)
 - James Golab, Ph.D. (Hydrogeologist)

GBRA schedule

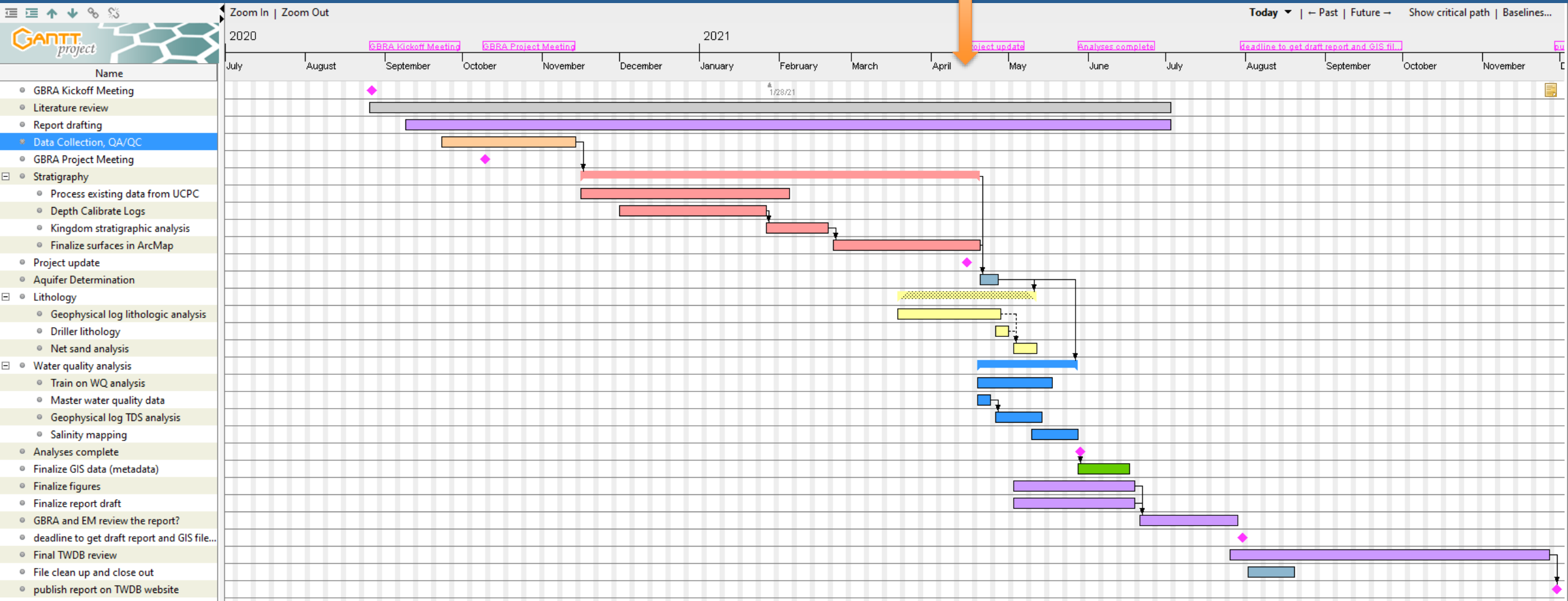
(pirated from Brian's presentation to the GBRA board)



Study goals

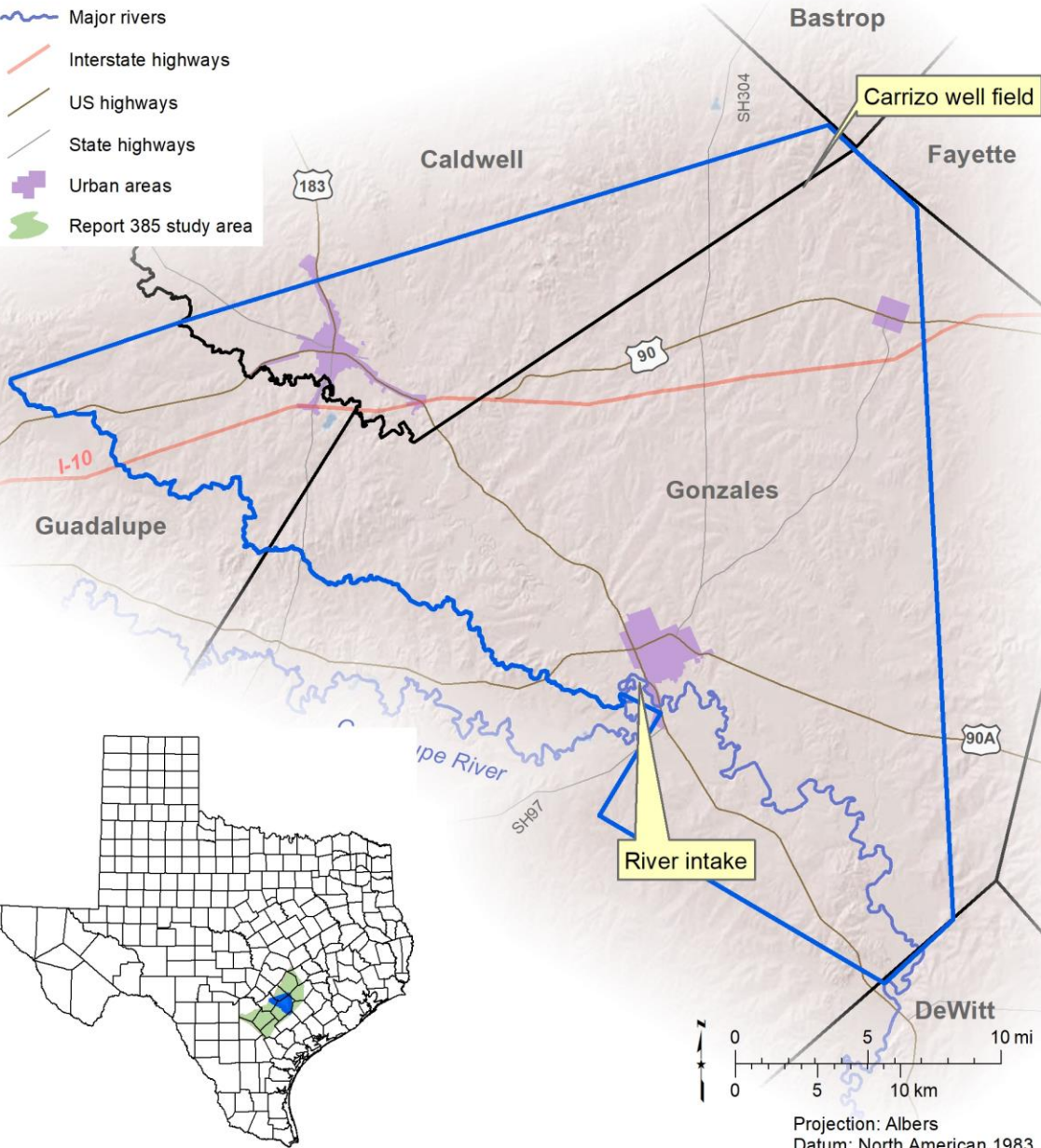
- Characterize the Carrizo-Wilcox Aquifer for the study area and provide GBRA with a report and GIS files
- This will include:
 - Maps of the stratigraphic surfaces
 - Maps of the net sands
 - Maps of the salinity zones
- GIS files will be rasters and shapefiles
- All data can be tied back to the geophysical well logs, drillers log, or water quality samples

TWDB schedule



GBRA ASR Aquifer Characterization Study Area

- ◇ GBRA ASR study area
- Texas counties
- ~ Major rivers
- Interstate highways
- US highways
- State highways
- Urban areas
- Report 385 study area

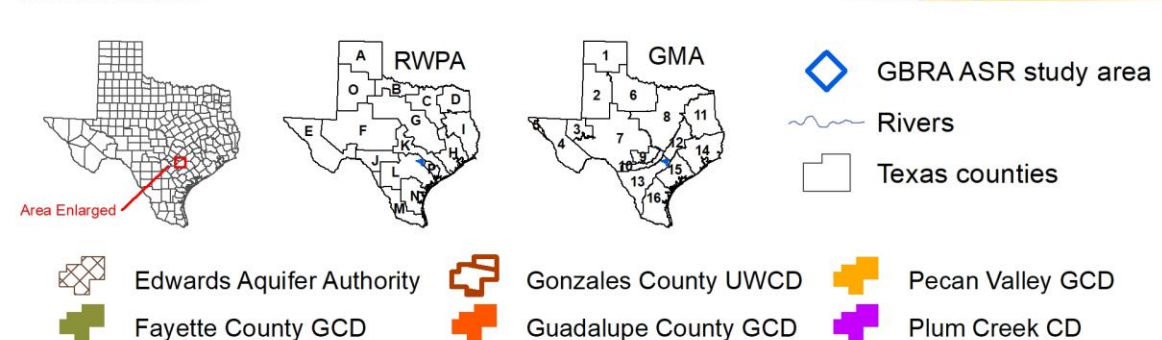
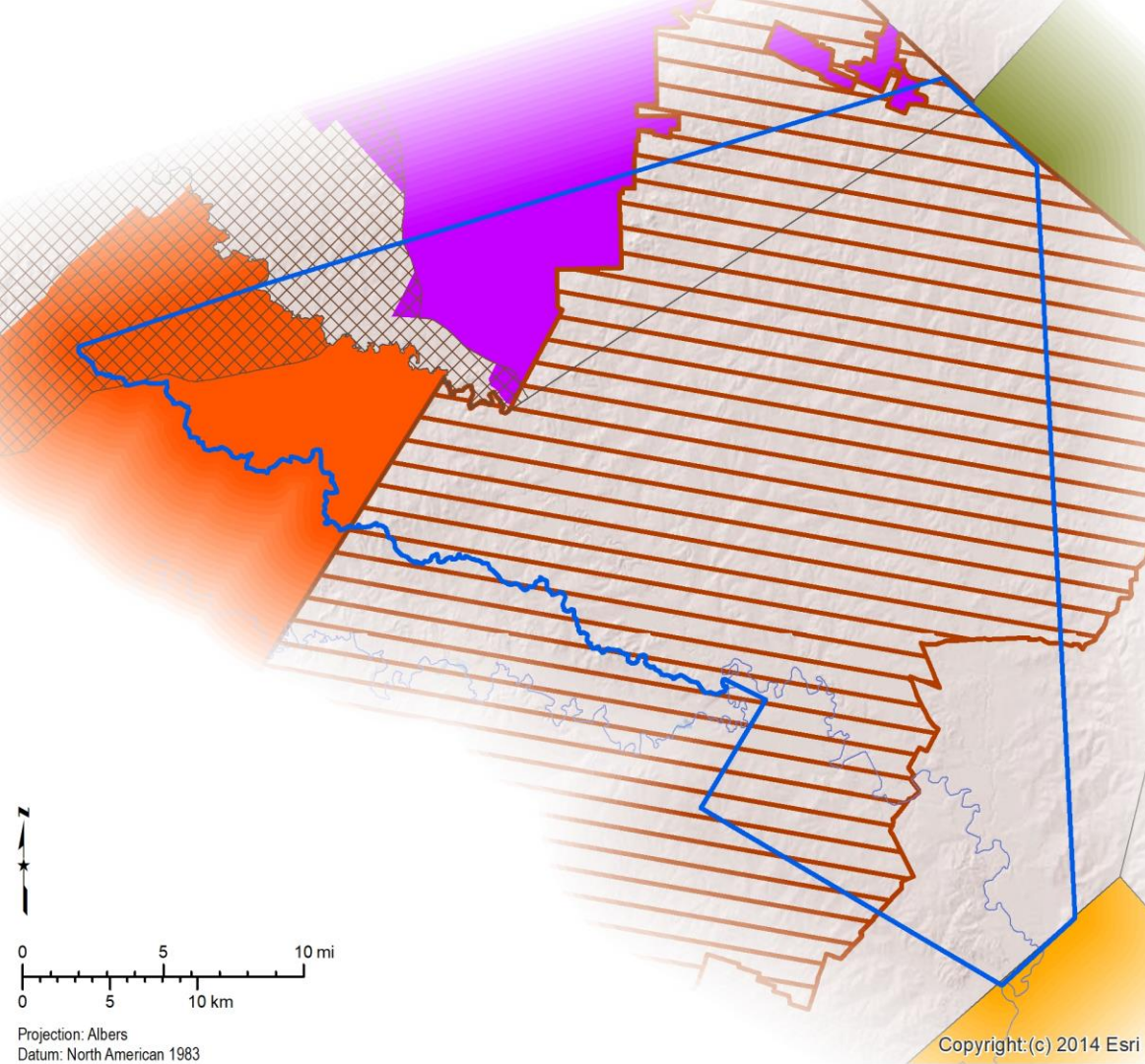


Study Area

- New Guadalupe River intake, south of San Marcos River and north of DeWitt County
- North corner based on existing land leases
- Includes existing pipelines in Caldwell and Gonzales counties
- The watershed line boundary was used to avoid existing projects
- Economic vertical limit of 2,000 ft deep

Administrative Boundaries

- Region L
- Groundwater Management Area (GMA) 13
- Groundwater Conservation Districts (GCD):
 - Gonzales County UWCD
 - Plum Creek CD
 - Guadalupe County GCD
 - Edwards Aquifer Authority



Brackish Groundwater Report 385

- Provides a framework for the GBRA ASR study
- Completed in 2020
- Mapped the official boundary of 5 aquifers plus the downdip extension of those aquifers to 35,000 mg/L TDS
- Regional study covering parts of 14 counties

Brackish Groundwater in Aquifers of the Upper Coastal Plains, Central Texas

John E. Meyer, P.G., Andrea D. Croskrey, P.G., Alysa K. Suydam, P.G.,
and Nathaniel van Oort

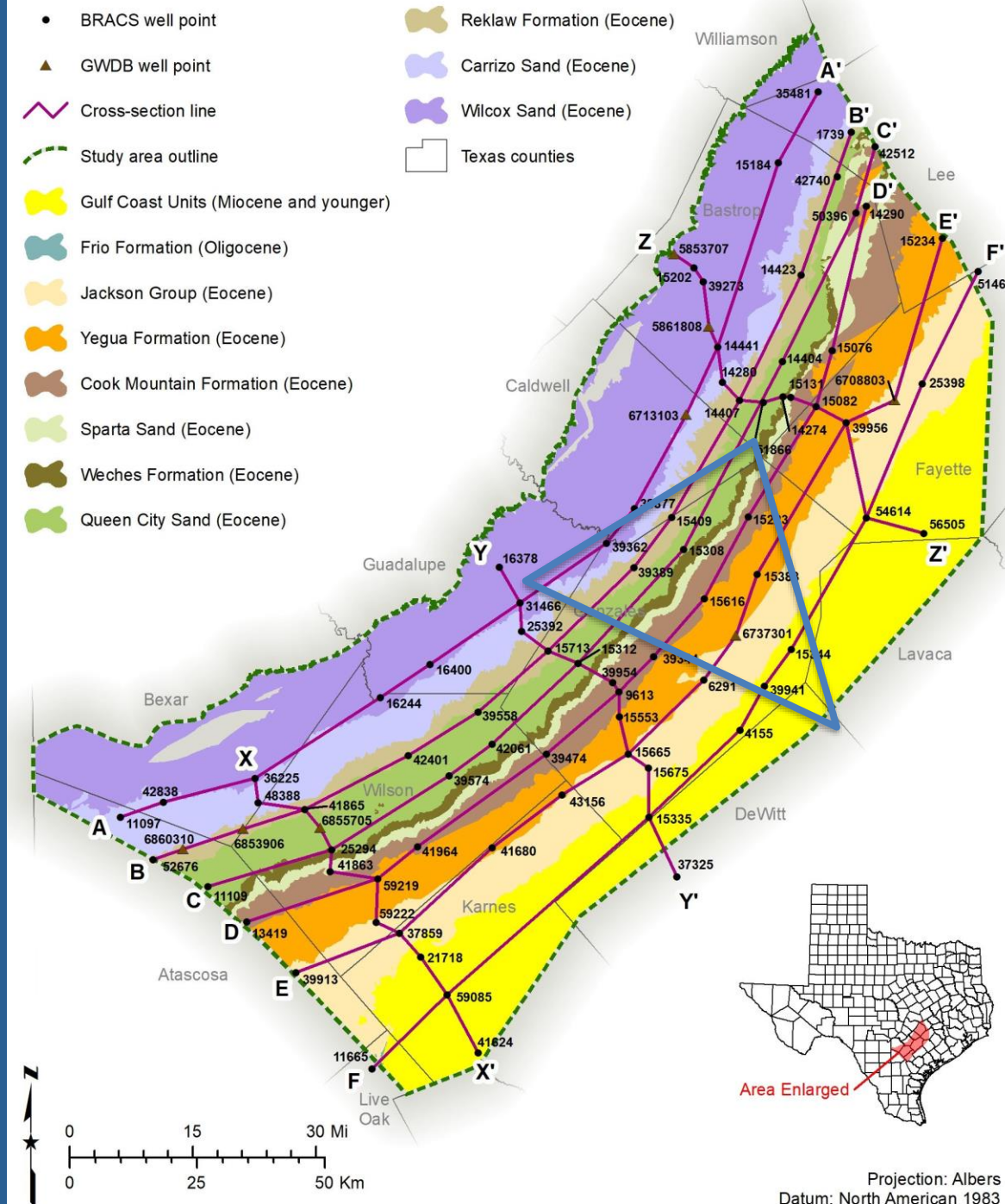
Report 385
December 2020

Texas Water Development Board
www.twdb.texas.gov



Stratigraphy

Epoch	Group	Formation	USGS nomenclature	Texas Hydrogeologic unit
Eocene	Jackson	Caddell	Vicksburg-Jackson confining unit	Yegua-Jackson Aquifer
		Moody's Branch		
	Claiborne	Hiatus	Upper Claiborne Aquifer	Confining unit
		Yegua	Middle Claiborne Confining unit	
		Cook Mountain	Middle Claiborne Aquifer	Sparta Aquifer
		Hiatus		Confining unit
		Sparta	Queen City Aquifer	
		Weches		
		Hiatus	Lower Claiborne confining unit	Confining unit
		Queen City		
		Reklaw		
		Hiatus		
	Paleocene	Wilcox	Carrizo	Lower Claiborne – upper Wilcox Aquifer
Hiatus				
Sabinetown				
Rockdale			Middle Wilcox Aquifer	
Paleocene	Midway	Seguin	Midway confining unit	Confining unit
		Wills Point		



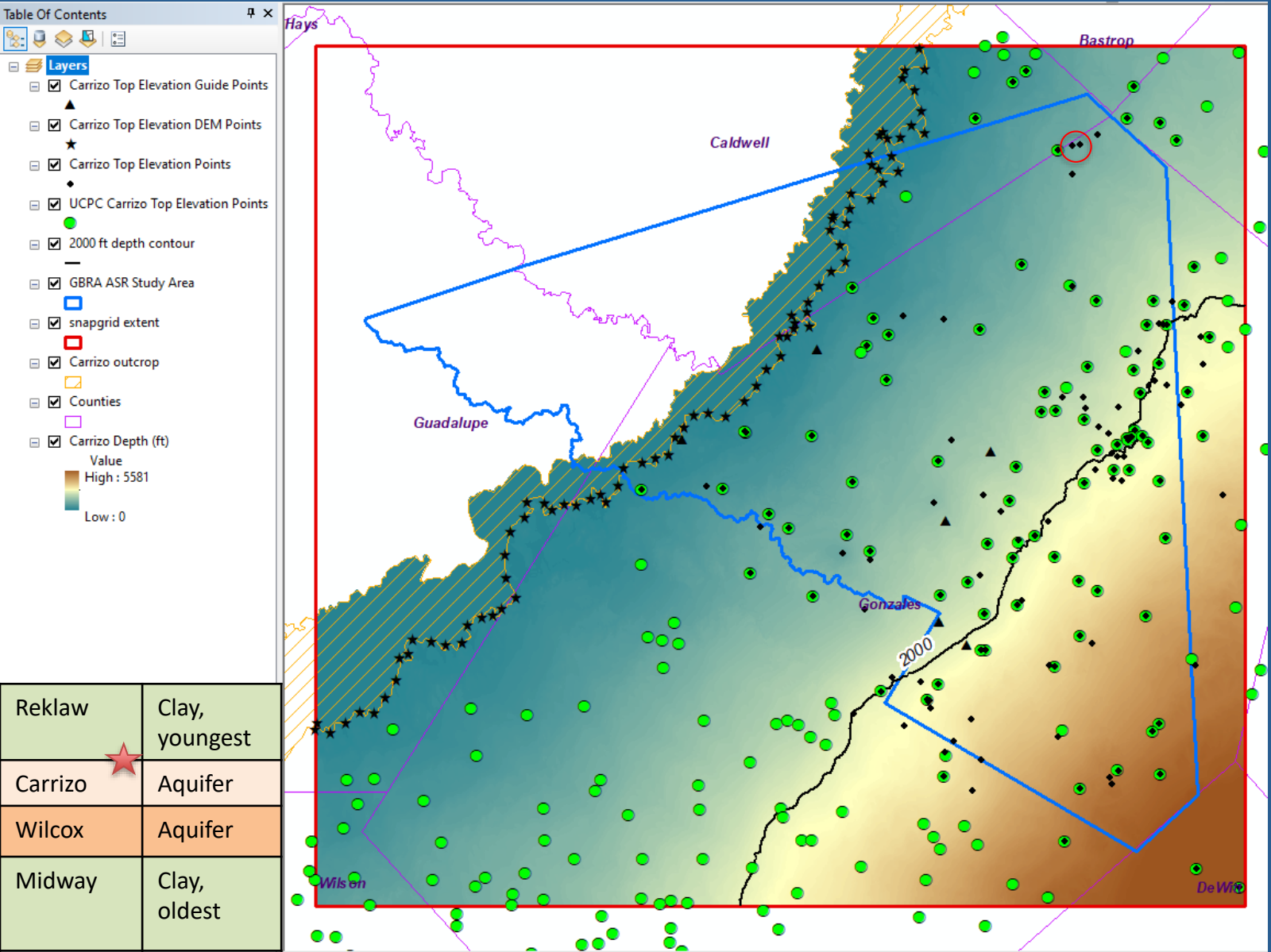
Stratigraphic column showing relationship between the epochs, formations, and hydrogeologic units. The United States Geological Survey (USGS) nomenclature is based on Ryder (1996). Texas hydrogeologic units are based on TWDB (2007a) and George and others (2011). This table does not reflect the entire Jackson or Midway group stratigraphy. This table is not scaled vertically in uniform units of time. Map on the report is from TWDB BRACS Report 385.

Stratigraphy

- Started with 251 wells, added 273 wells for a total of 524
- Started with 75 Carrizo top picks, added 51
- Started with 81 Wilcox top picks, added 53
- Started with 110 Midway top picks, added 205

Top of the Carrizo

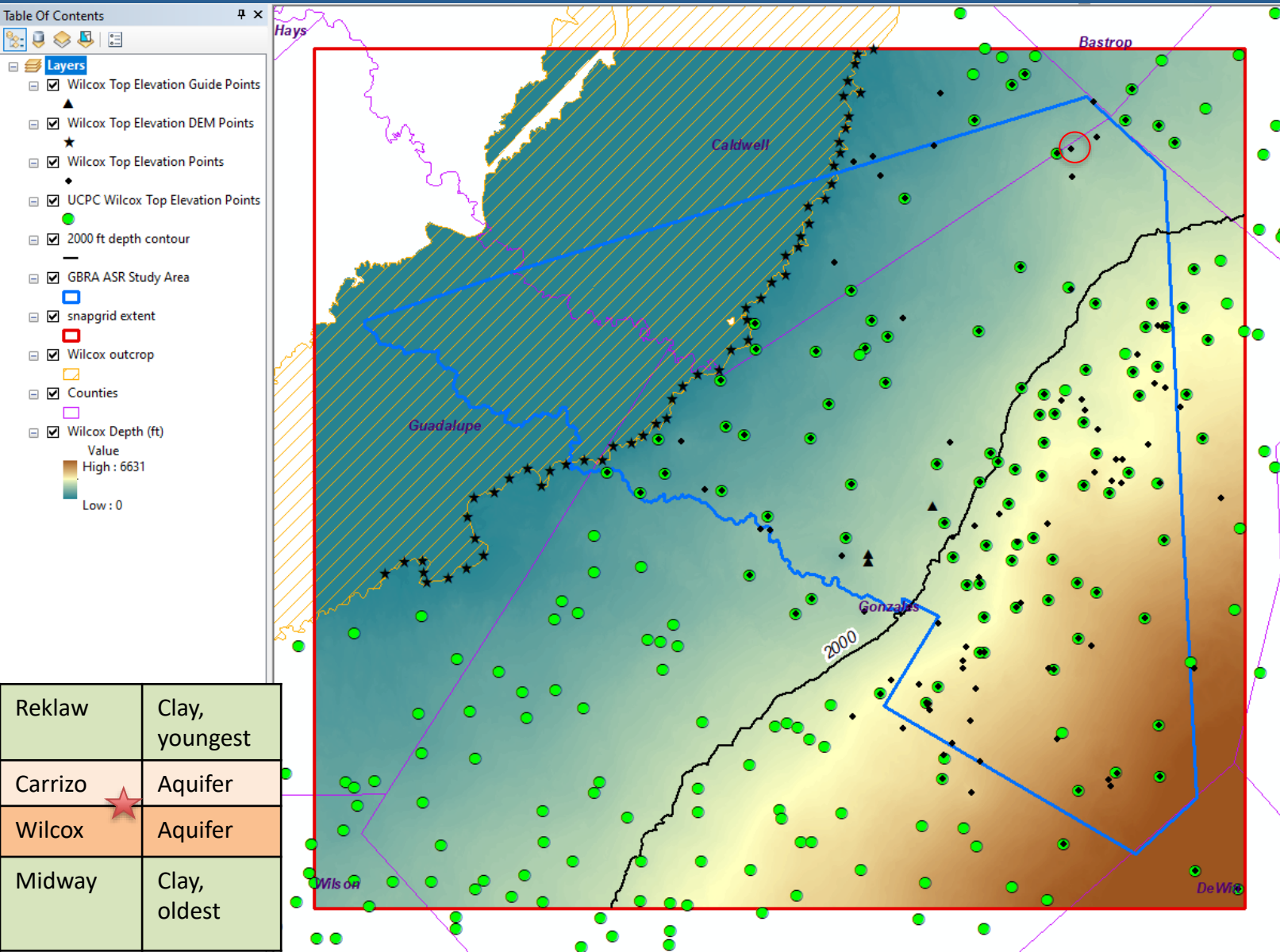
(bottom of the Reklaw)



- Depth increases to the SE, towards Gulf Coast
- Top of the Carrizo reaches depth of 2000 feet near middle of the county
- Depth to Carrizo at GBRA #1 and #2 is 740-780 ft

Top of the Wilcox

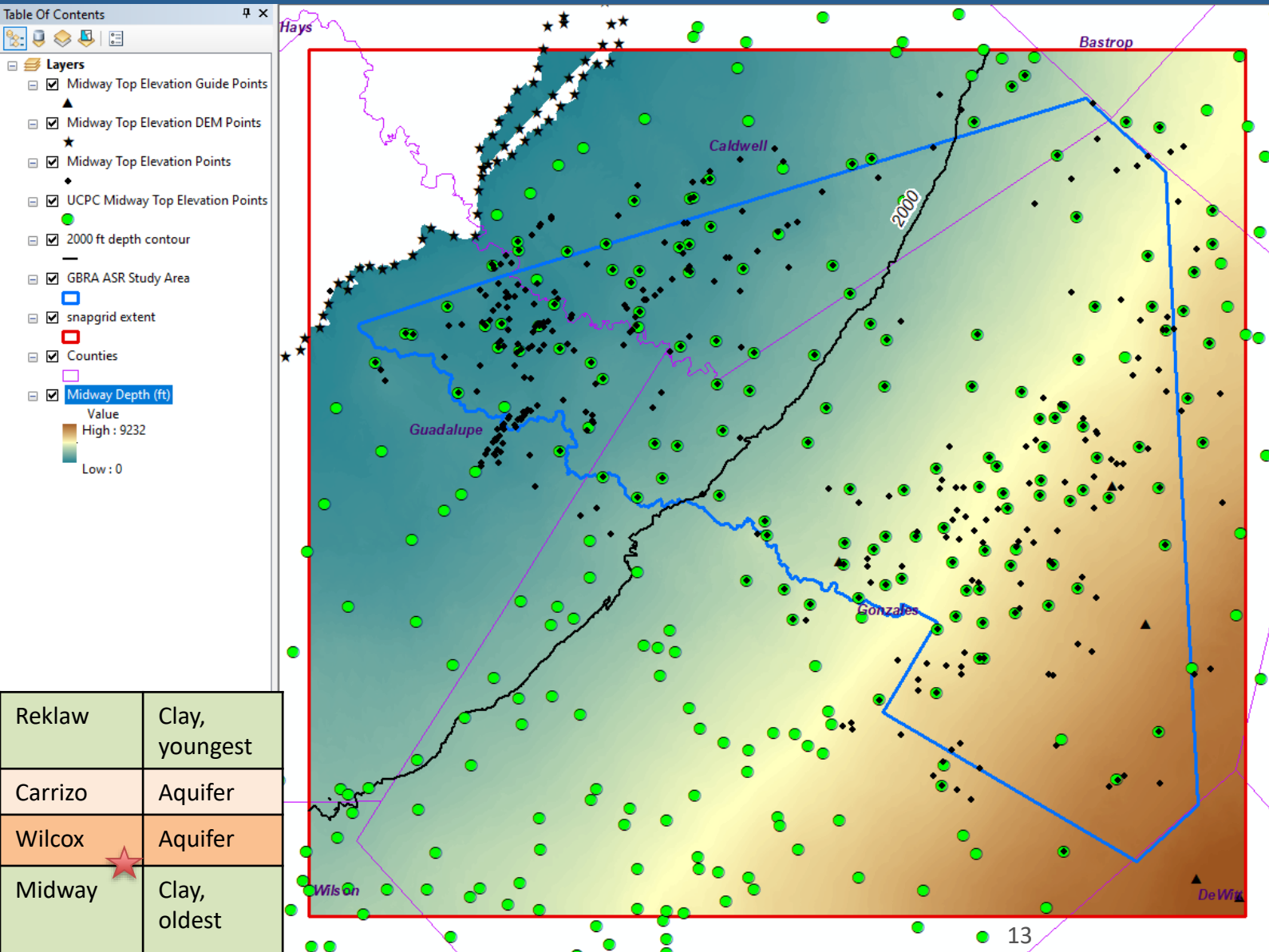
(bottom of the Carrizo)



- Depth increases to the SE
- Depth to Wilcox at GBRA #2 is 1,389 ft
- As the layers get deeper, the 2,000 ft depth limit moves to the northwest, and a smaller area is economically available within that depth limit

Top of the Midway

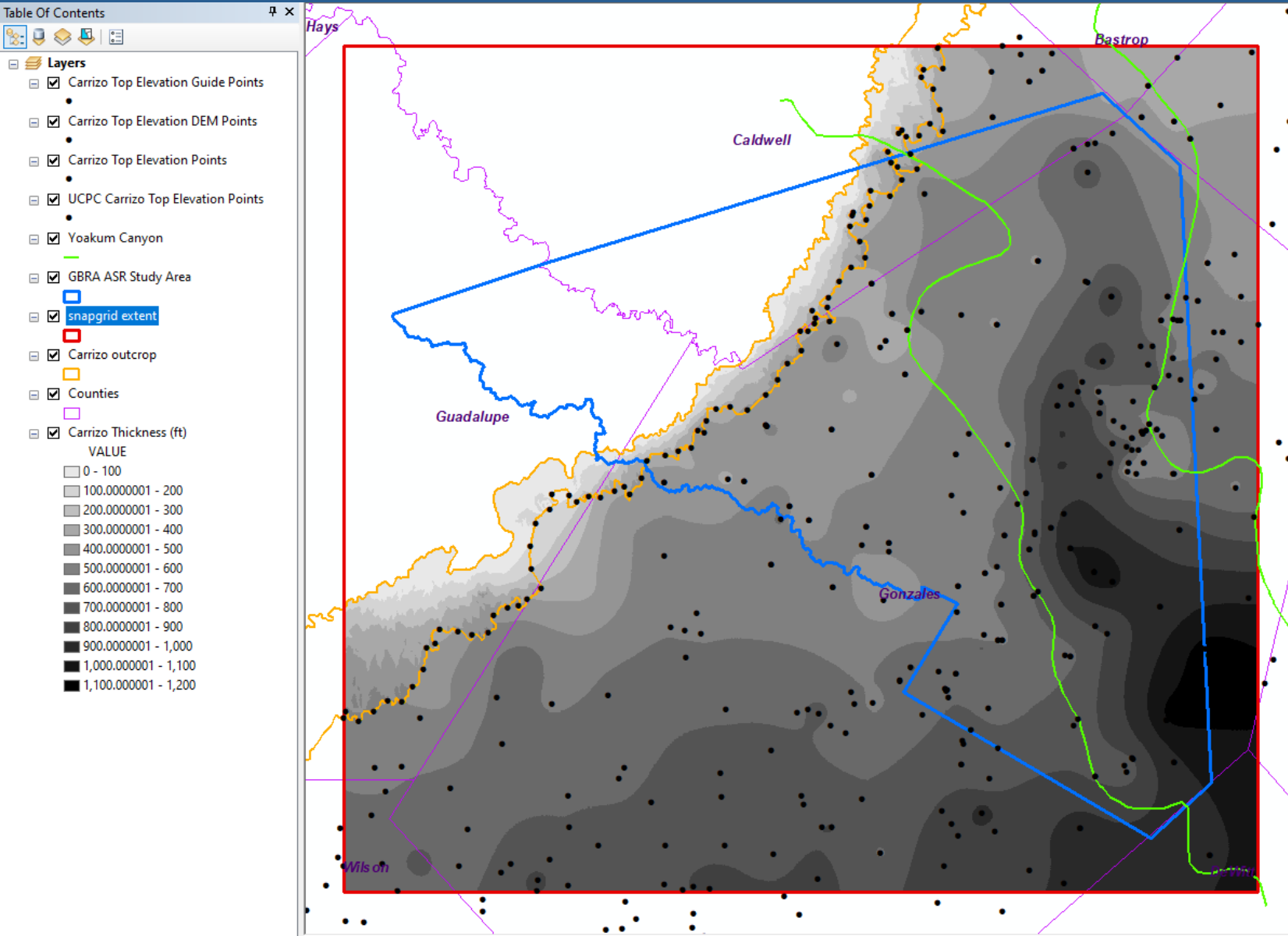
(bottom of the Wilcox)



- Depth increases to the southeast
- At the Carrizo well field, the Midway Formation is too deep to show on the well logs (~3,240 ft)
- Note how far to the northwest the 2,000-foot depth contour is

Carrizo Thickness

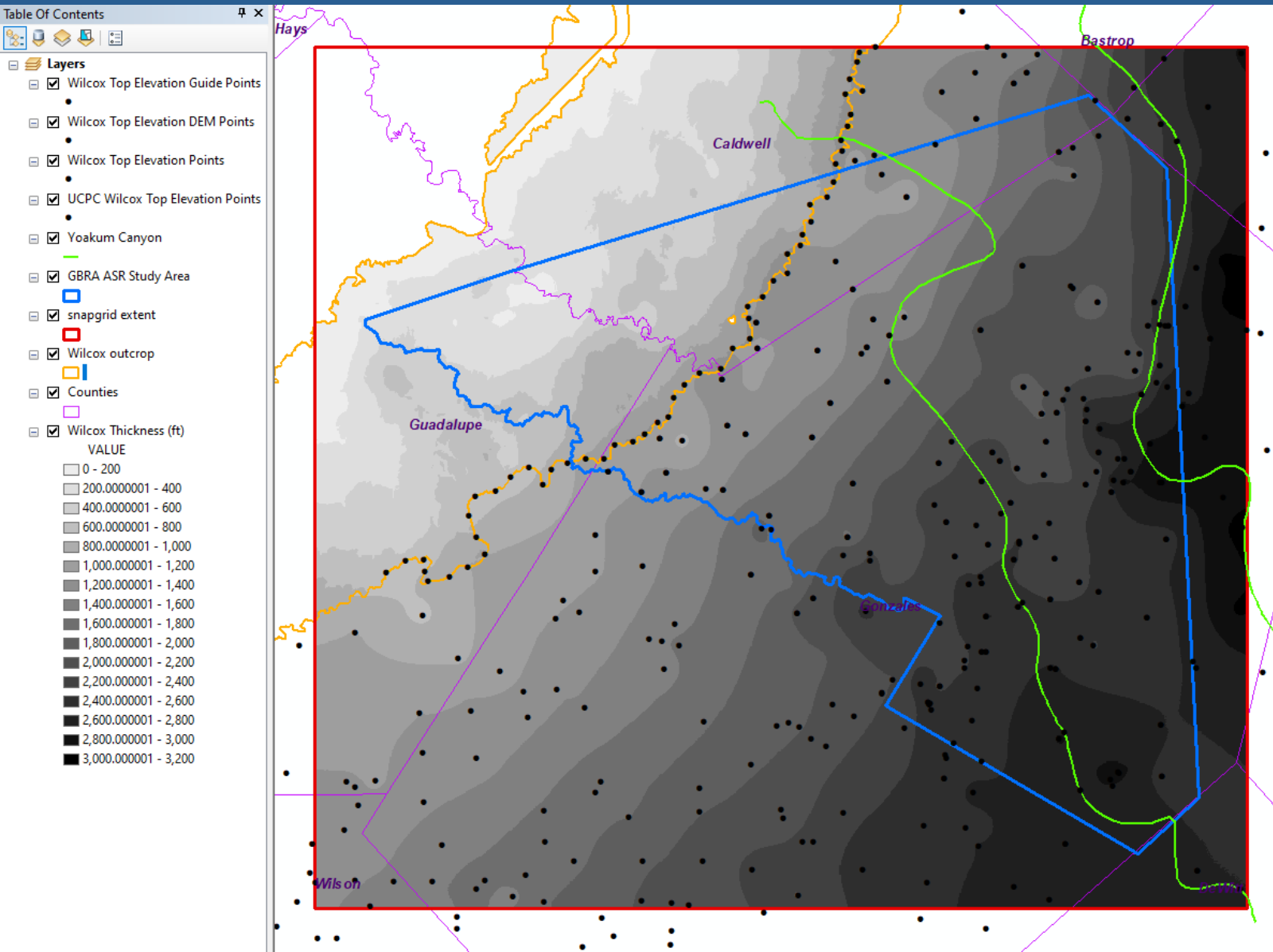
(also known as isochore)



- Yoakum Canyon!
- Thickening towards the coast (southeast)
- Thickness at the Carrizo well field is bit over 600ft

Wilcox Thickness

(also known as isochore)



- Wilcox is much thicker than the Carrizo
- >3,000ft at the southern end of the study area
- It is also increases in thickness towards the coast (southeast)

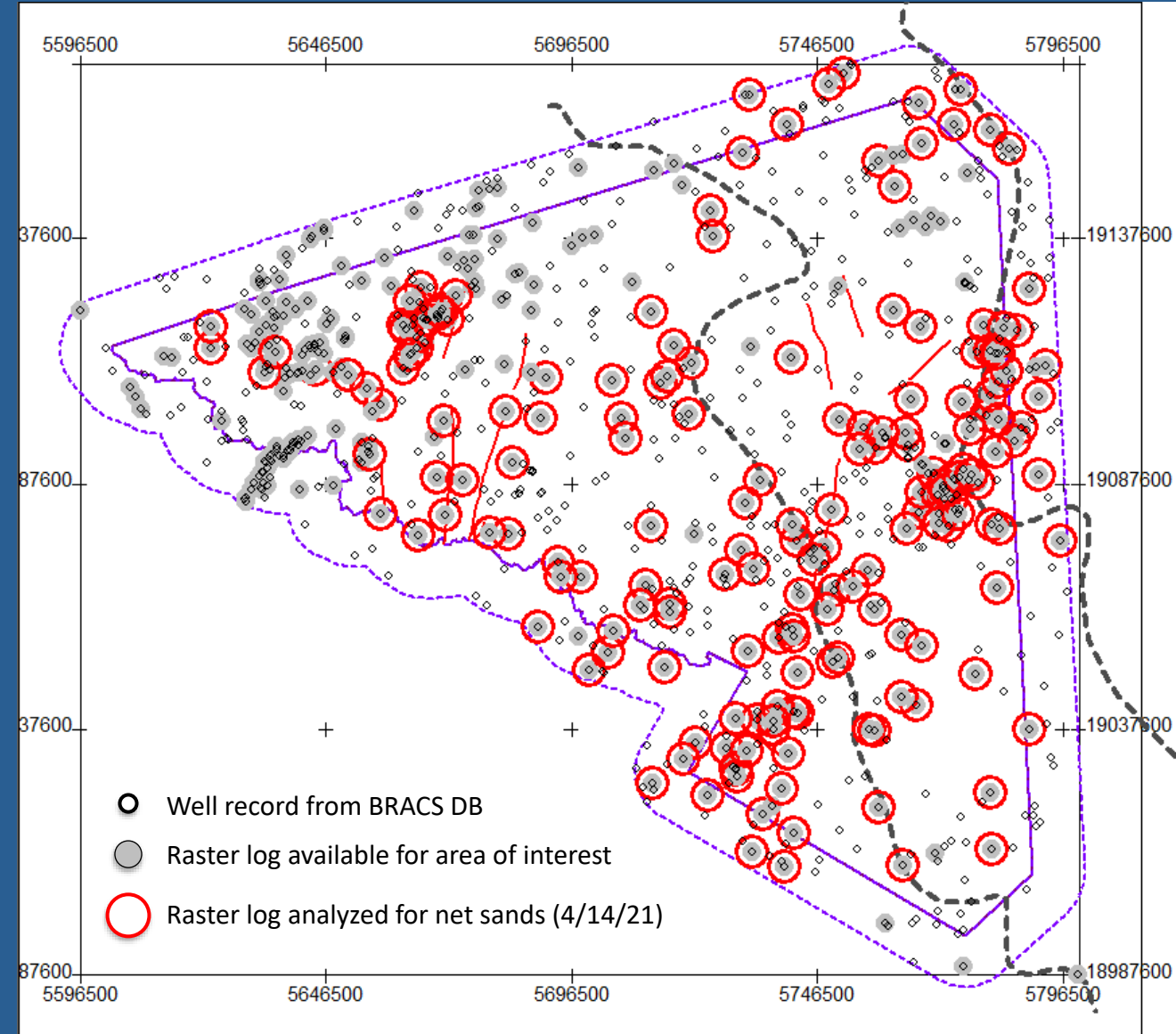
Net Sands

- The Carrizo and Wilcox in the study area consist of interbedded sands and clays
- “Clean” (little to no clay) sand layers produce groundwater more economically and are better suited for ASR projects
- Net sands is the total thickness of sand layers within a given interval
- Net sands may be calculated from driller’s logs or geophysical logs
- Lithology was evaluated using a four-tier method shown here:

Tier	Description
Sand	~100% sand
Sand with clay	~75% sand and ~25% clay
Clay with sand	~25% sand and 75% clay
Clay	~100% clay

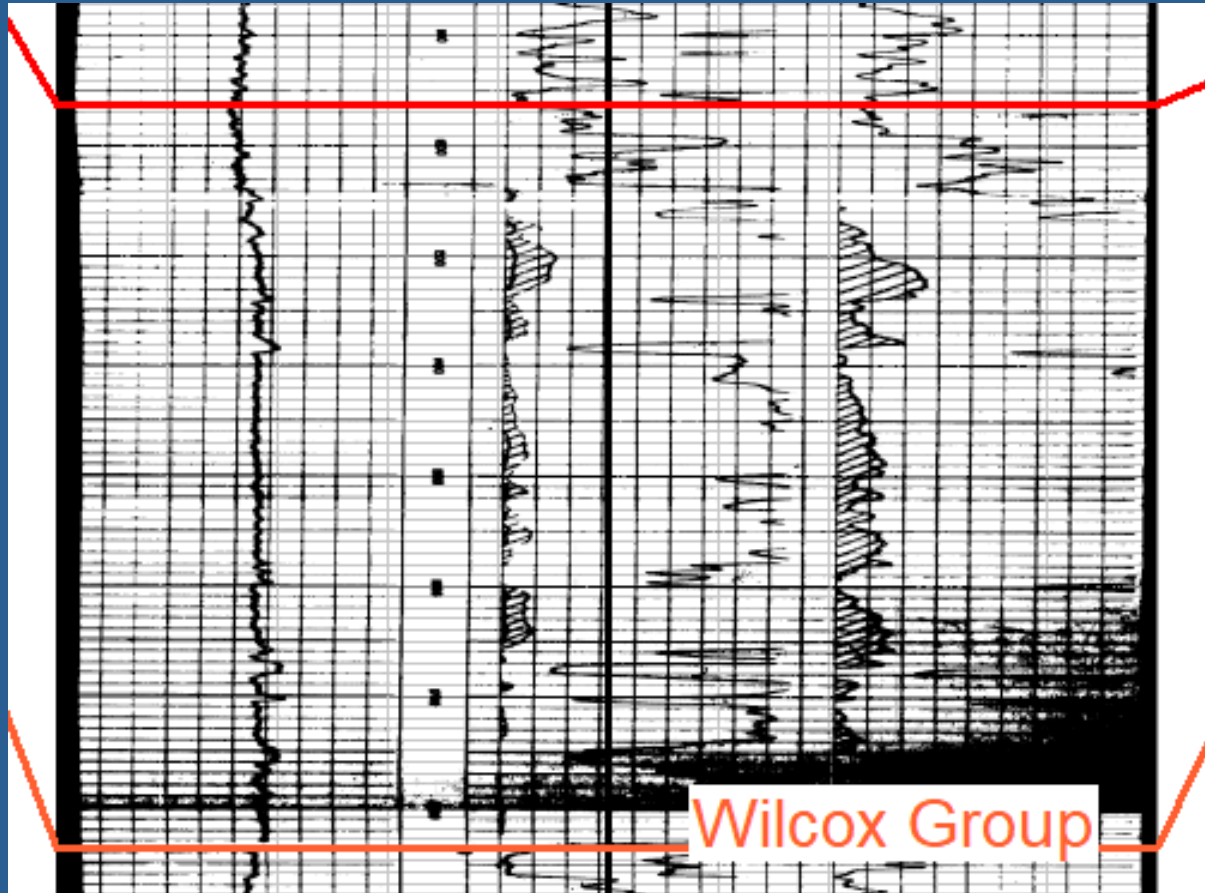
Net Sands: Progress

- Report 385 had 94 wells used for net sands analysis of the Carrizo Fm and/or Wilcox Group within the study area
- Report 385 analyzed net sands for 8 formations
- Present study focuses on the entire Carrizo Fm and the Wilcox Group shallower than 2,500 feet deep
- Currently 186 well logs have been analyzed for net sands
- Looking at drillers' logs next

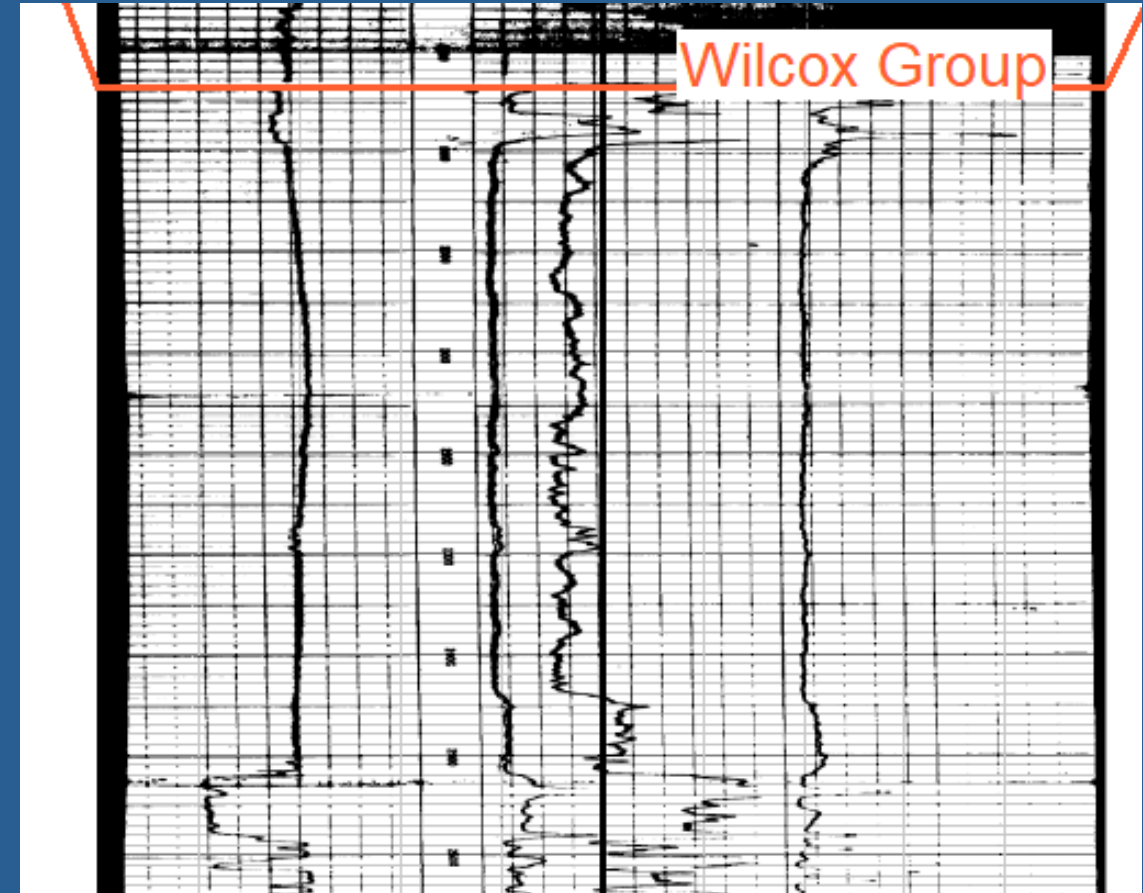


Net Sands: Progress

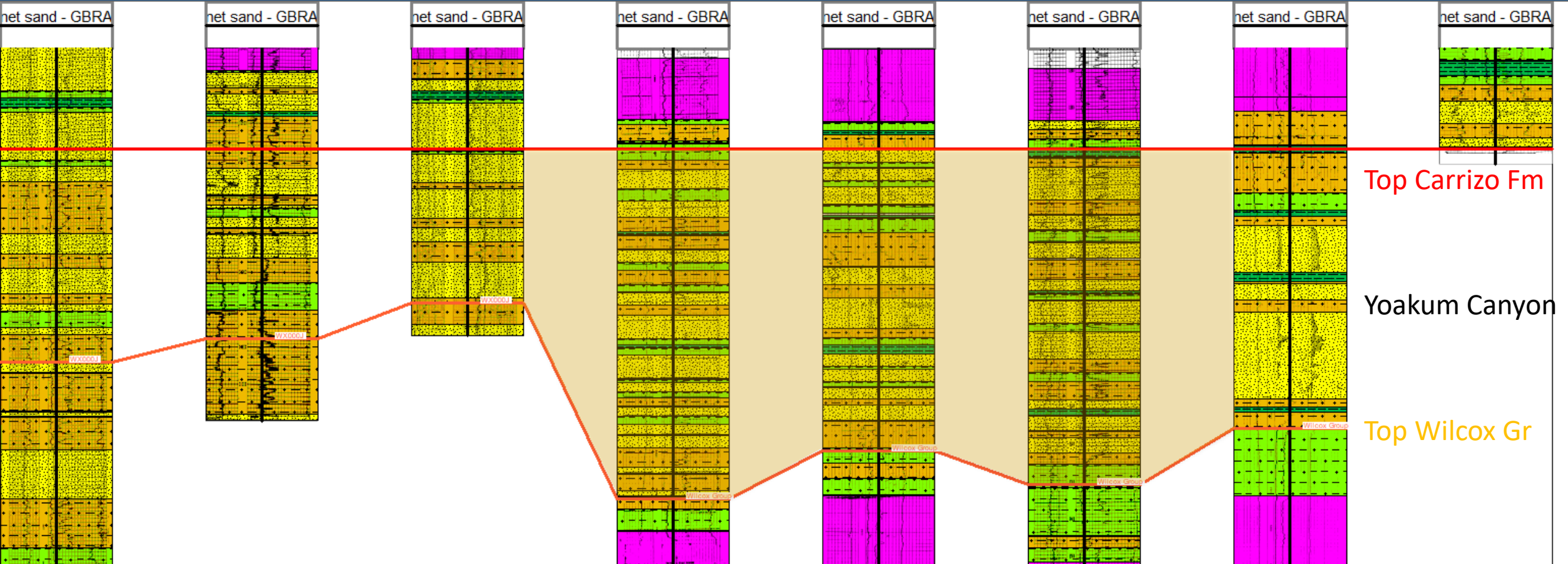
- The Carrizo Fm is characterized in the study area by thick sands with very high resistivity



- The upper portions of the Wilcox Group in the study area contain thinner sands or clay

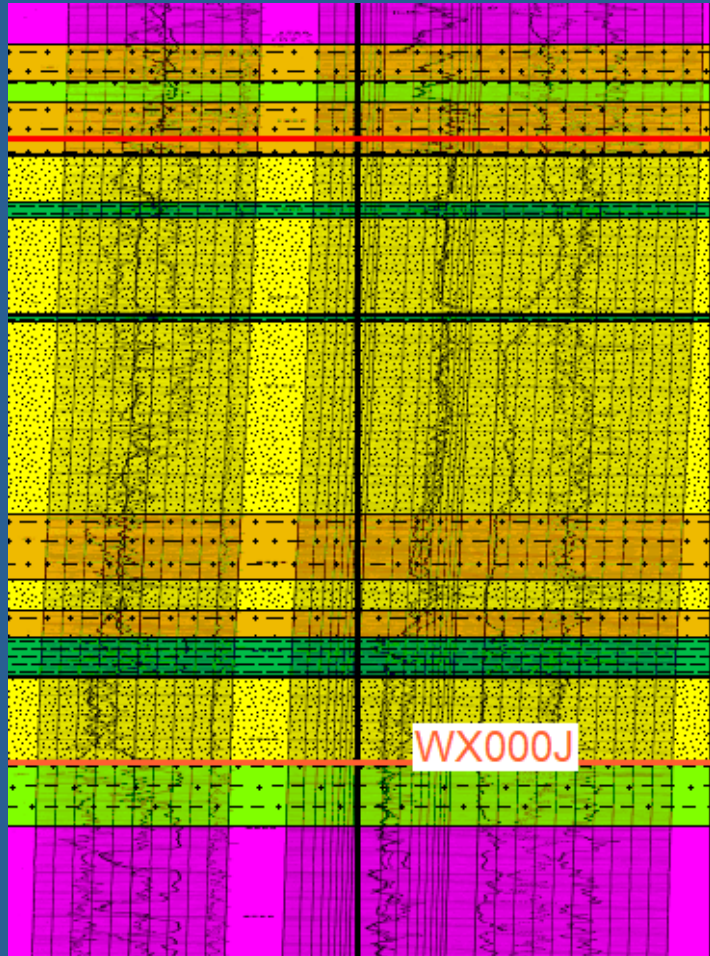


Net Sands: Yoakum Canyon

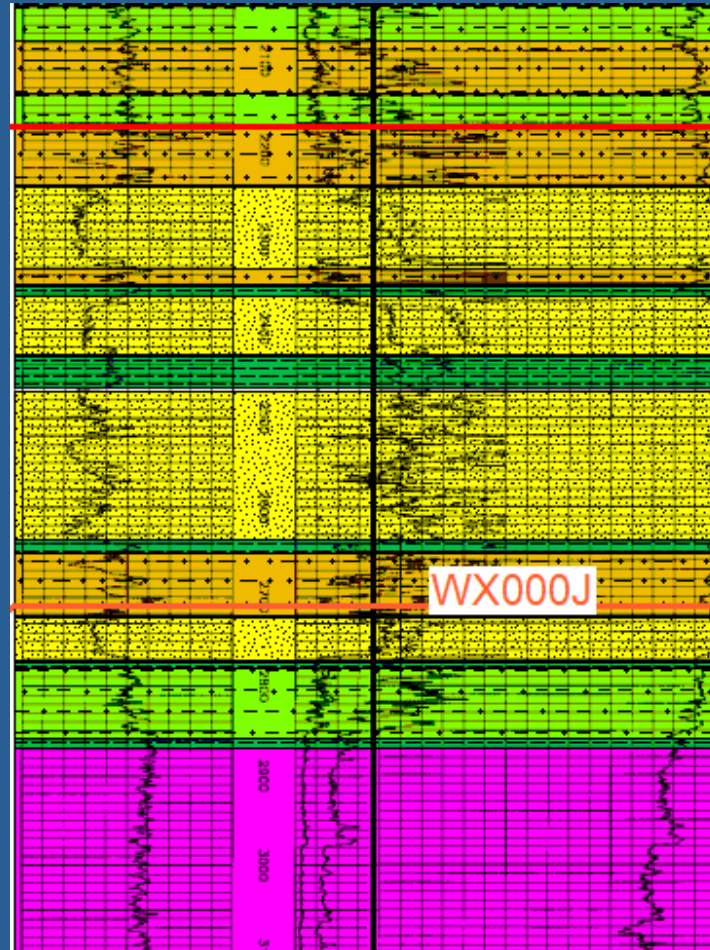


Net Sands: Yoakum Canyon

Outside Yoakum Canyon



Within Yoakum Canyon



- The Yoakum Canyon is shale dominated within the Wilcox Group
- Carrizo Fm throughout most of study area is dominated by thick sand beds
- The Carrizo Fm within the Yoakum Canyon area is generally thicker and characterized by moderately thinner, stacked sand bodies

Next steps & Questions

- TWDB staff will keep cranking out the interpretations, maps, and finish the report
- GIS files and draft report to GBRA by July 30, 2021
- Will GBRA have time to review the draft report?
 - Then we would aim to deliver the draft report at the end of June so they can provide comments by mid-July
- Final report might not be published to TWDB website until the Fall
- Presentations or outreach?
 - GBRA board? GCDs?