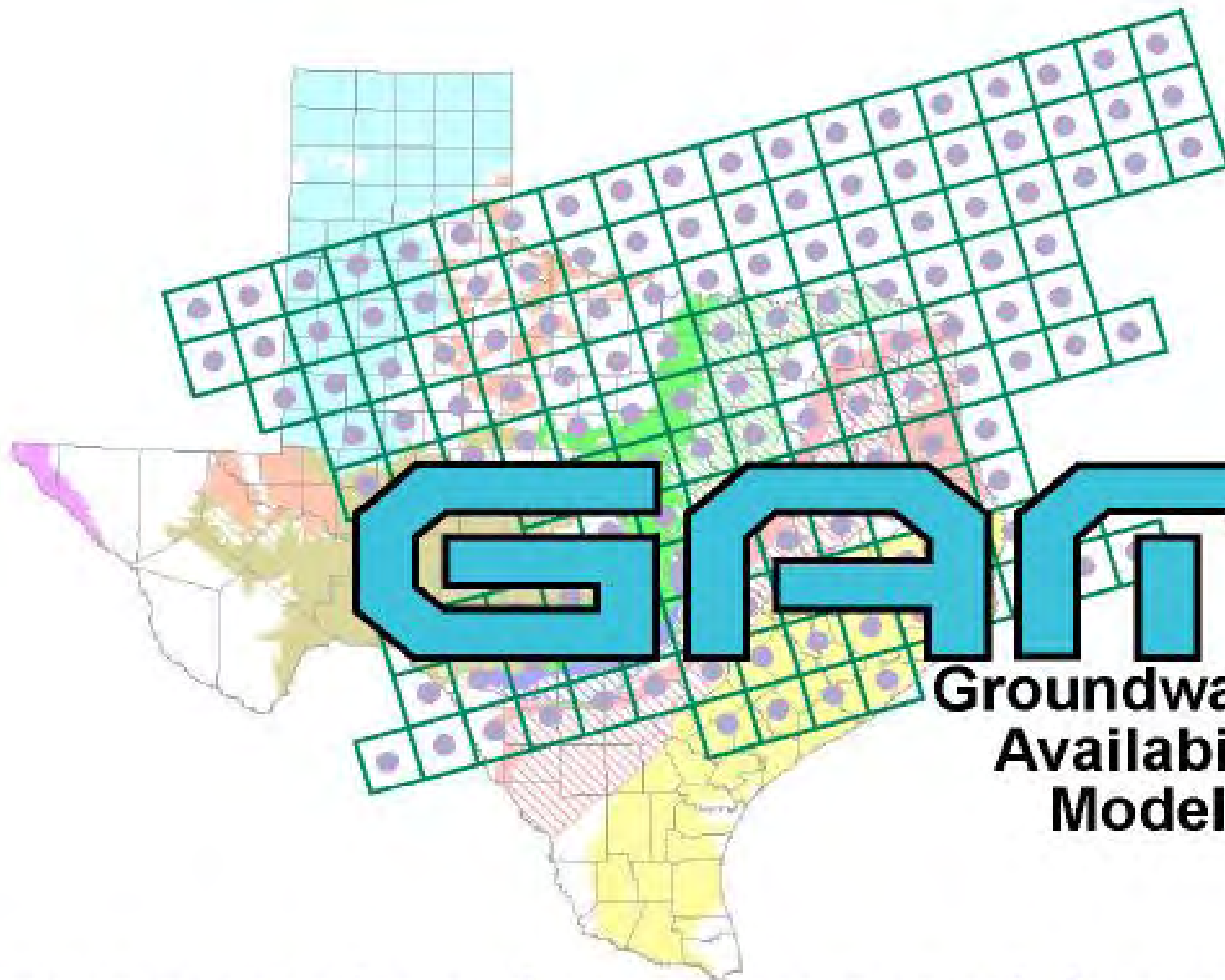




GMA

**Groundwater
Availability
Modeling**

texas water development board

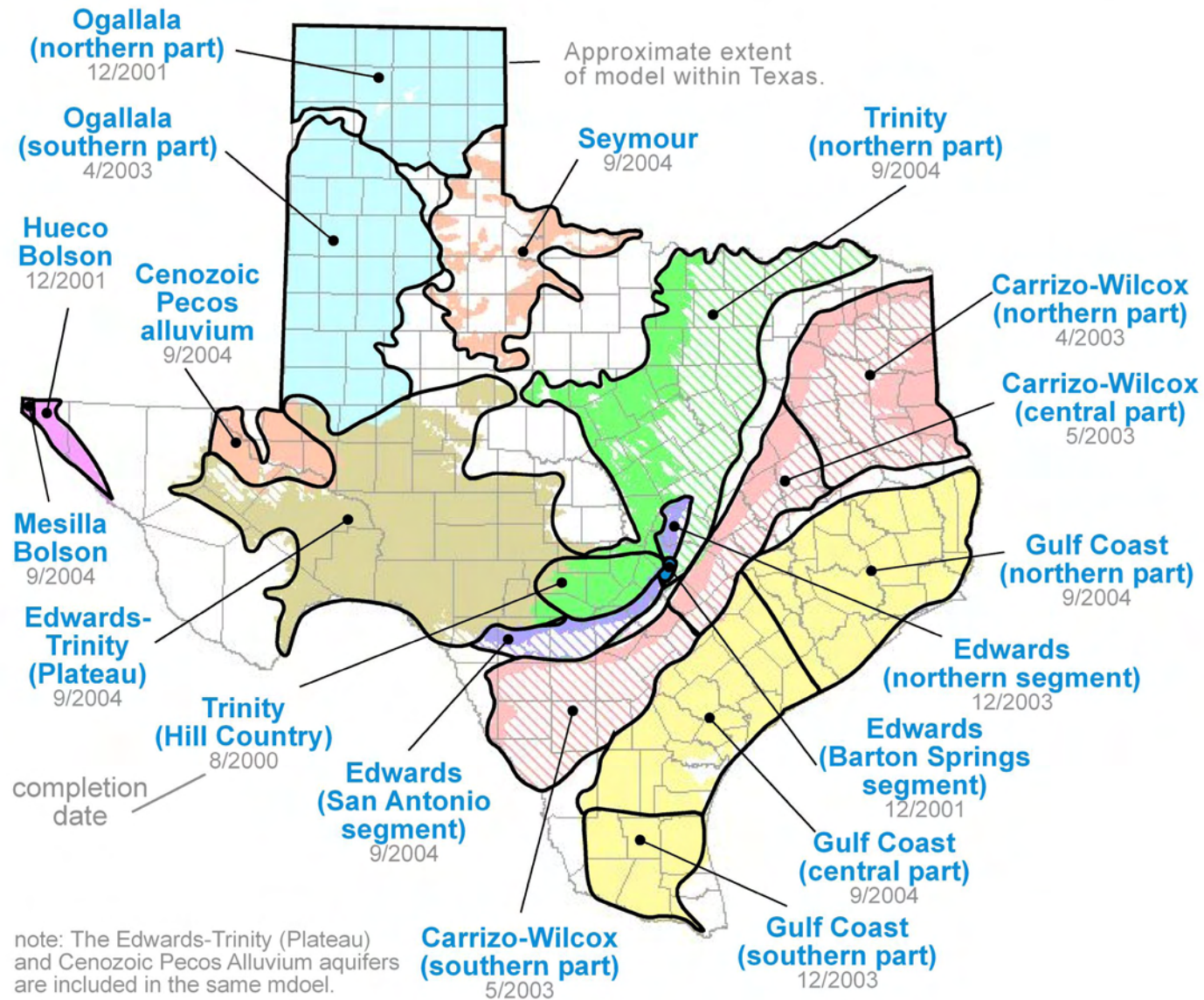
Agenda for Stakeholder Advisory Forum (SAF) Meeting No. 2 July 11, 2007

- Overview of approach to development of surfaces
- Water levels
- Recharge/discharge
- Hydraulic properties
- Conceptual model of groundwater flow
- Next steps/project schedule

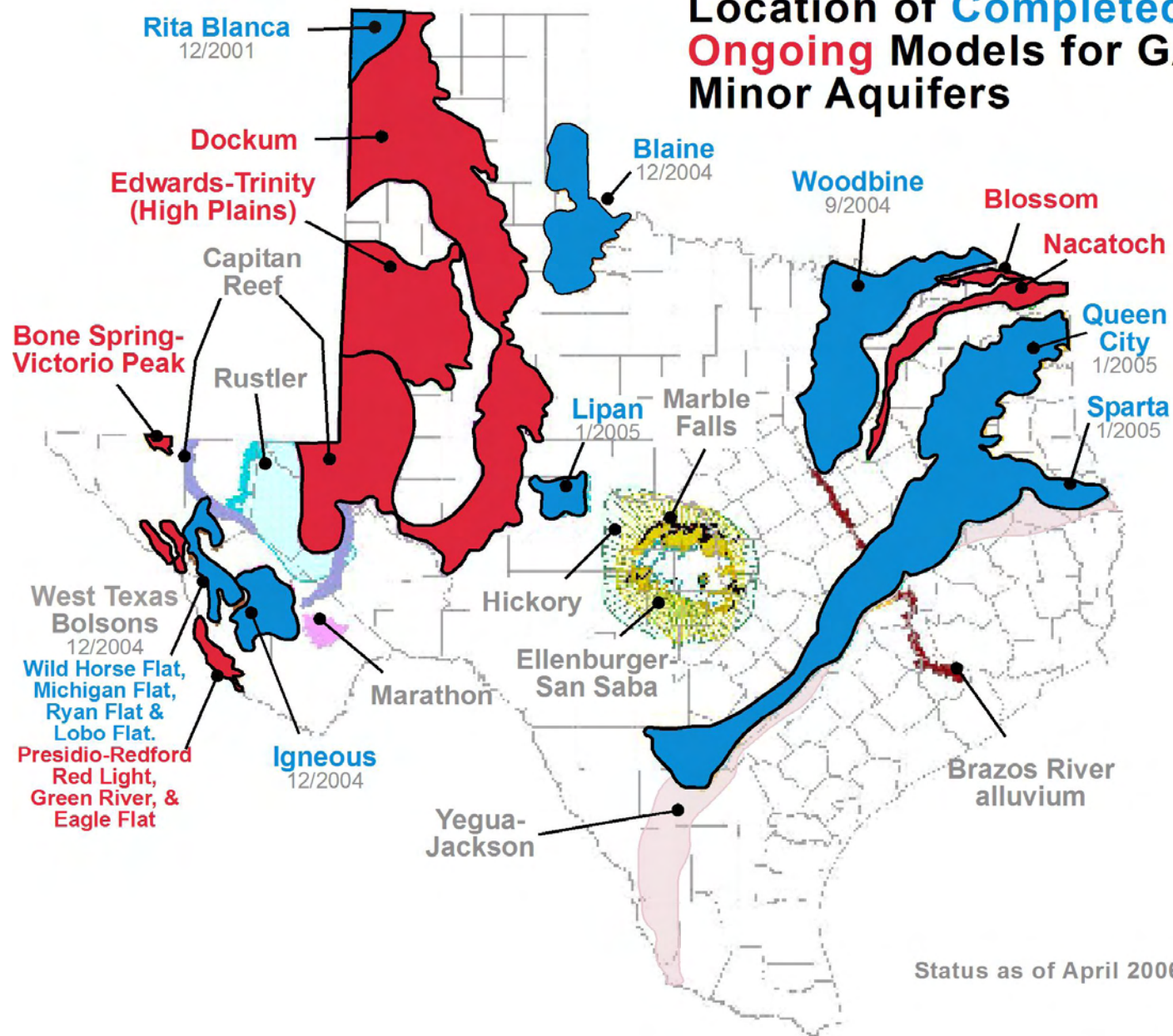


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Location of completed GAMs for the major aquifers of Texas

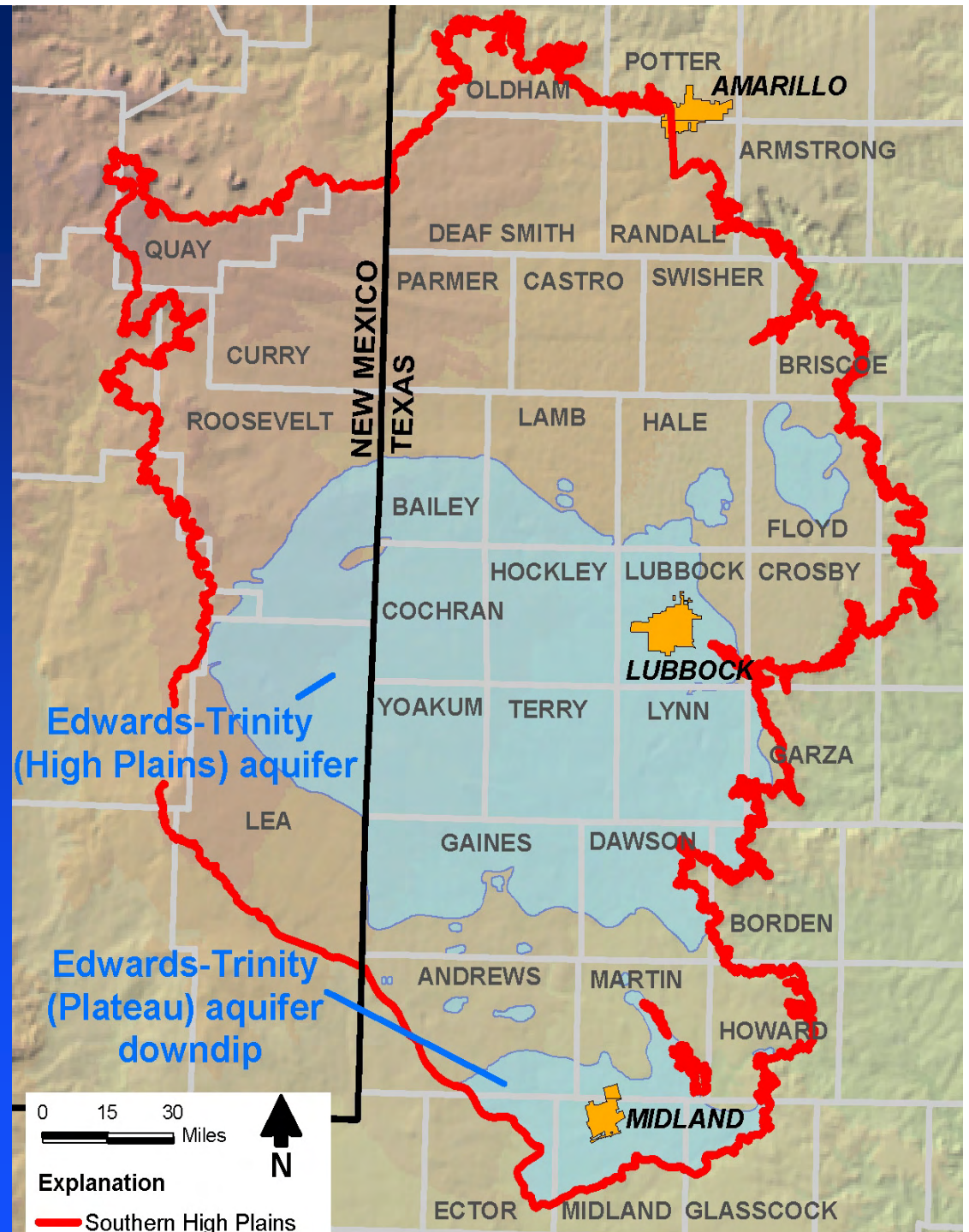


Location of **Completed** and **Ongoing** Models for GAM: Minor Aquifers



Status as of April 2006

Edwards Trinity (High Plains) Aquifer



Lower Cretaceous Geologic Units Nomenclature and Equivalent Hydrostratigraphic Units

System	Series	Group	Formation		Hydrogeologic Unit
			Edwards - Trinity (High Plains)	Edwards - Trinity (Plateau)	
Quaternary	Pleistocene to recent		Blackwater Draw	Alluvium	Ogallala or High Plains aquifer - includes uppermost permeable sediments of Washita Group
Tertiary	Late Miocene to Pliocene		Ogallala	Ogallala	
Early (Lower) Cretaceous	Comanche	Washita	Duck Creek	Boracho or Ft. Lancaster	Confining units (primarily shale) Edwards Aquifer - Comanche Peak and Walnut formations contain shale interbeds
			Kiamichi		
		Fredericks- burg	Edwards	-----?-----	
			Comanche Peak	Finlay or Fort Terrett	
			Walnut		
		Trinity	Antlers Sand	Antlers Sand and Basal Cretaceous Sand	Trinity Aquifer
Triassic		Dockum	Chinle or Cooper Canyon	Upper	Confining Unit

Approach to Geologic Characterization

- 250 geophysical logs selected from the BEG log database. Additional review for starting depth, log type and quality led to 111 logs applied during the study.
- Driller's logs from TCEQ: at least one report pulled for each of the ~ 1,600 state well grids in the study area; more than 10,000 report reviewed. Final evaluation led to 1,792 selected logs based on geologic description, location information, pump test data, screen interval and water levels.
- Information provided by GWCDs
- Key reports - Brand (1953), Knowles and other (1984), Fallin (1989), McGowen and others (1977), Geologic Atlas of Texas

Locations of Geologic Control Compiled for Project Database



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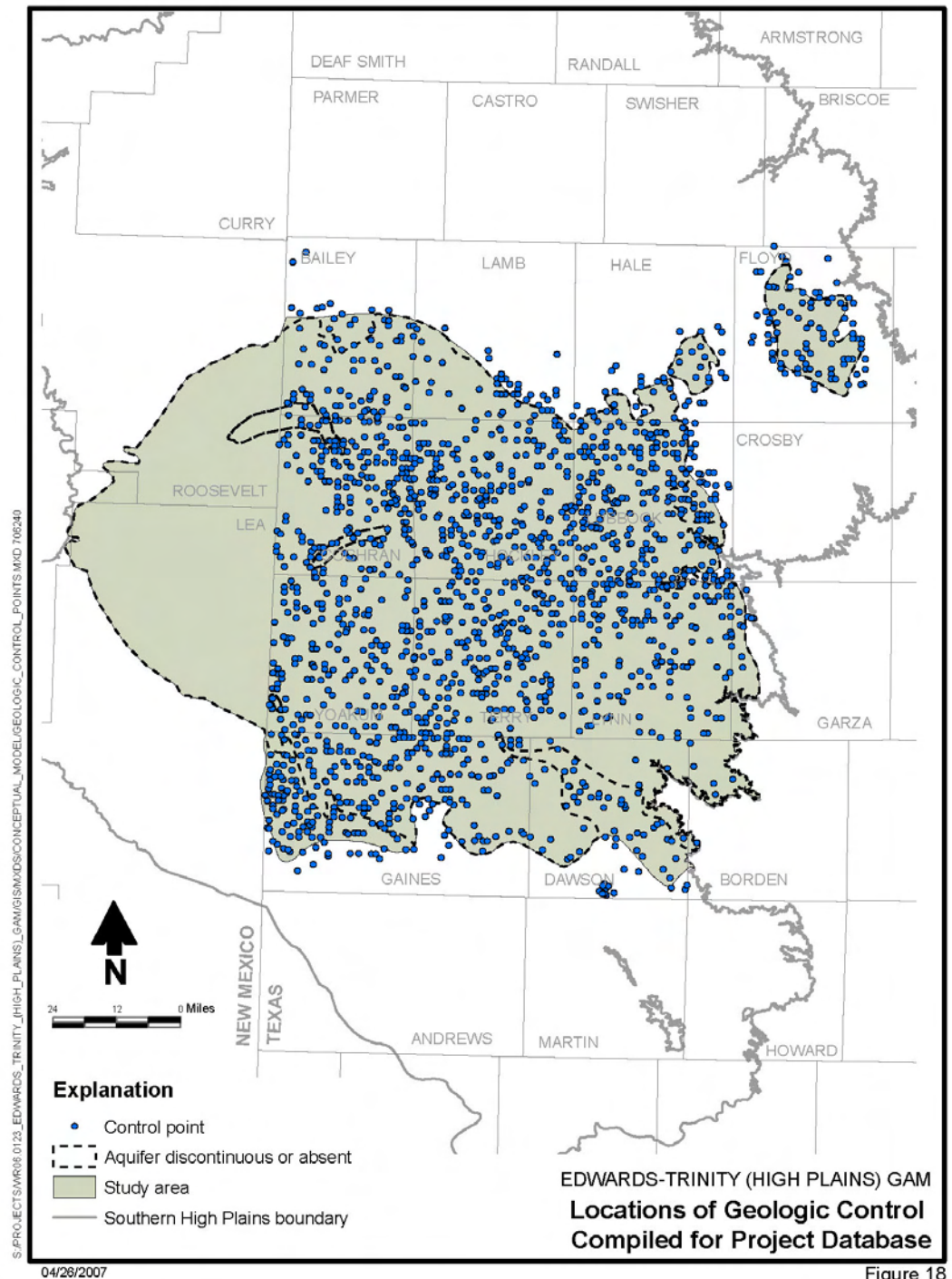
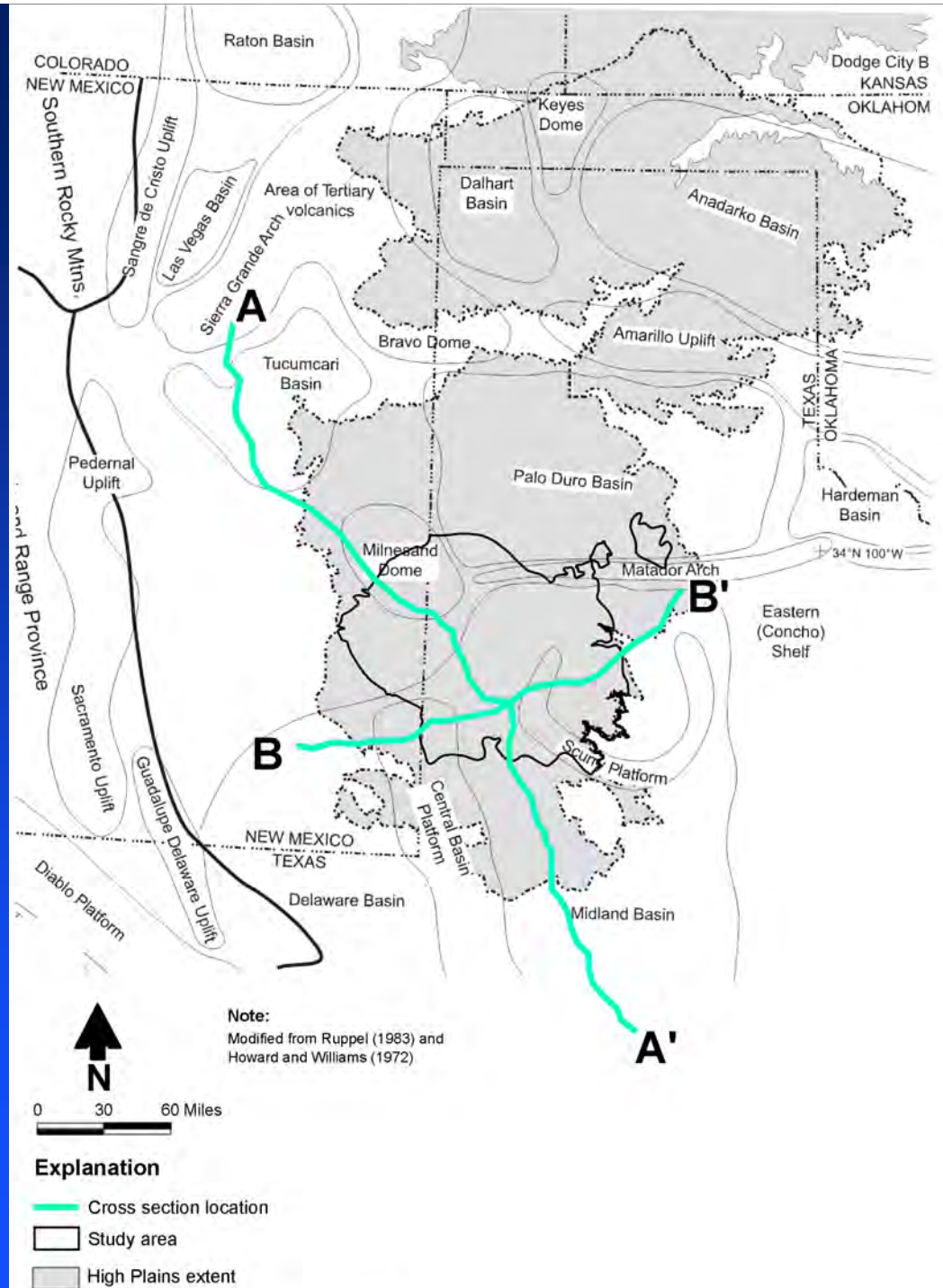
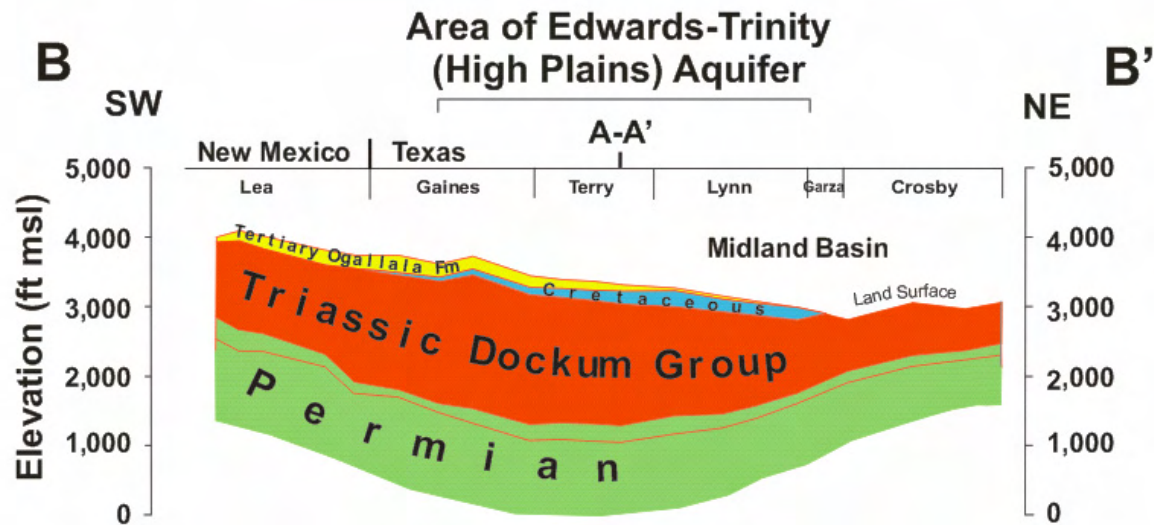
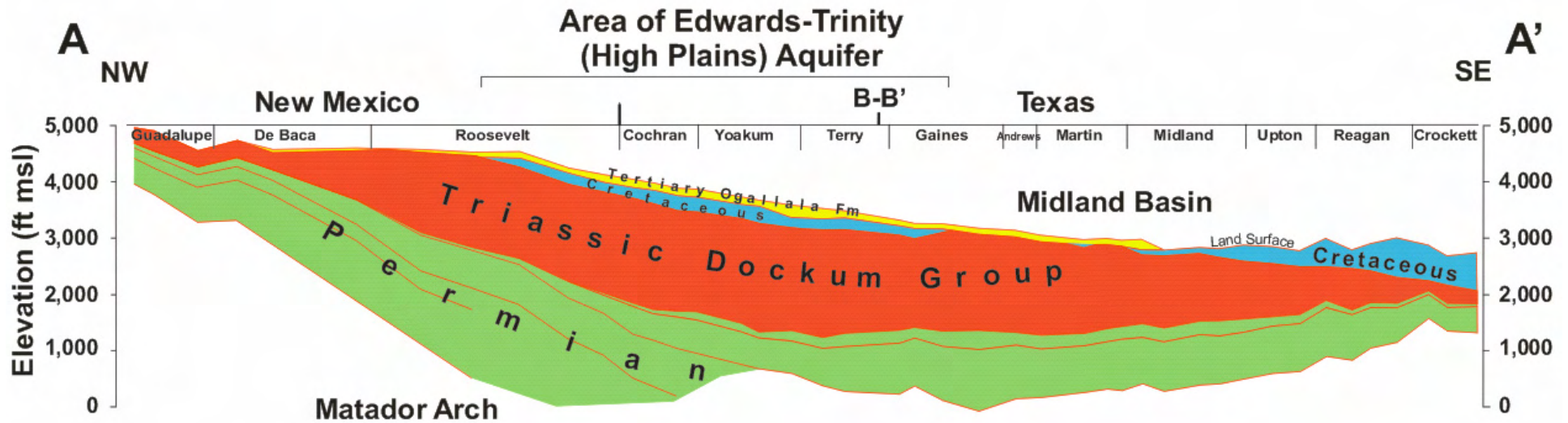


Figure 18

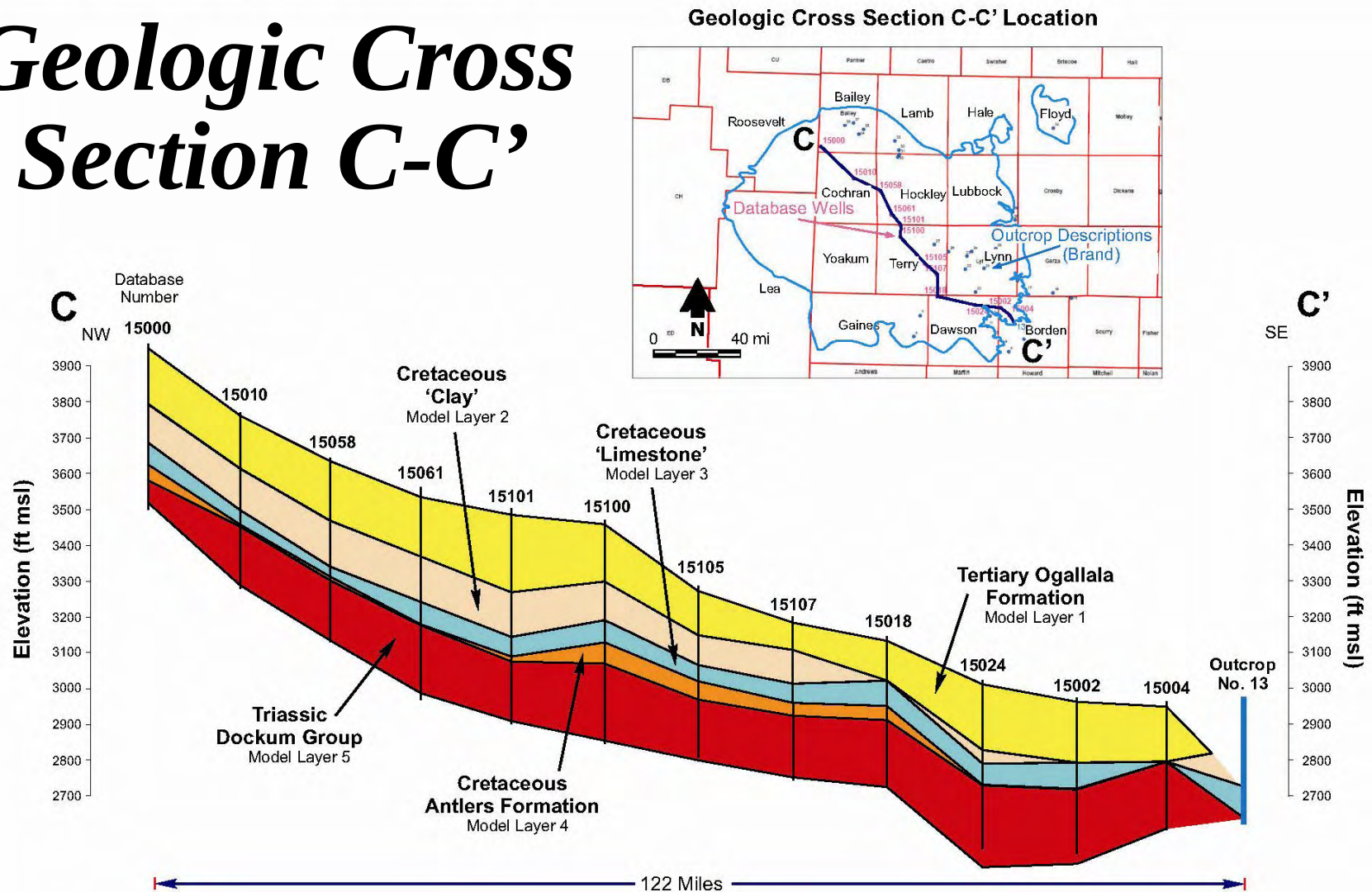
Regional Geologic Cross Section Locations



Geologic Cross Section A-A' and B-B'



Geologic Cross Section C-C'



Note: Well placement not to horizontal scale

EDWARDS-TRINITY (HIGH PLAINS) GAM
Geologic Cross Section C-C'

Geologic Cross Section D-D'

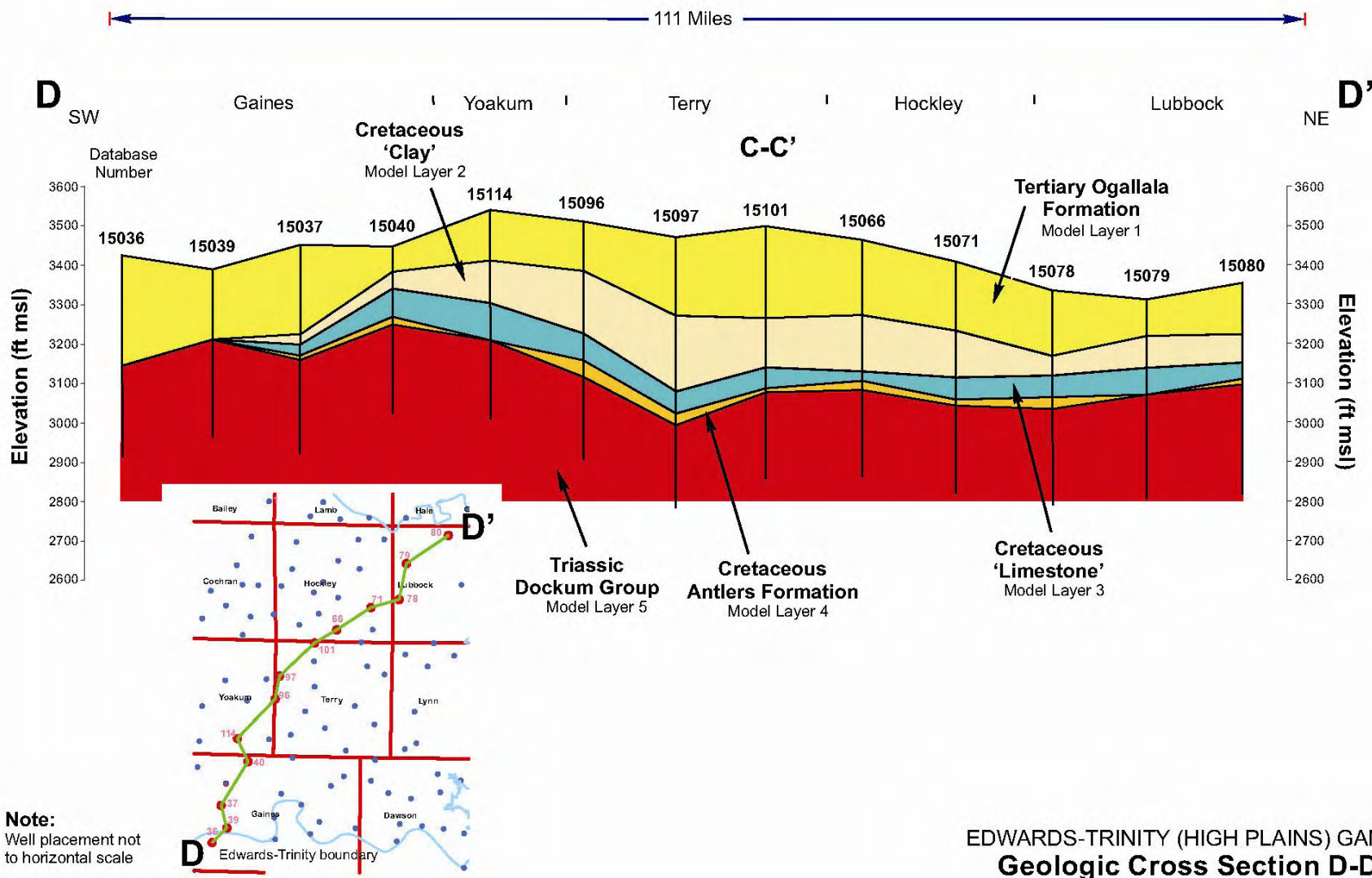


Figure 20

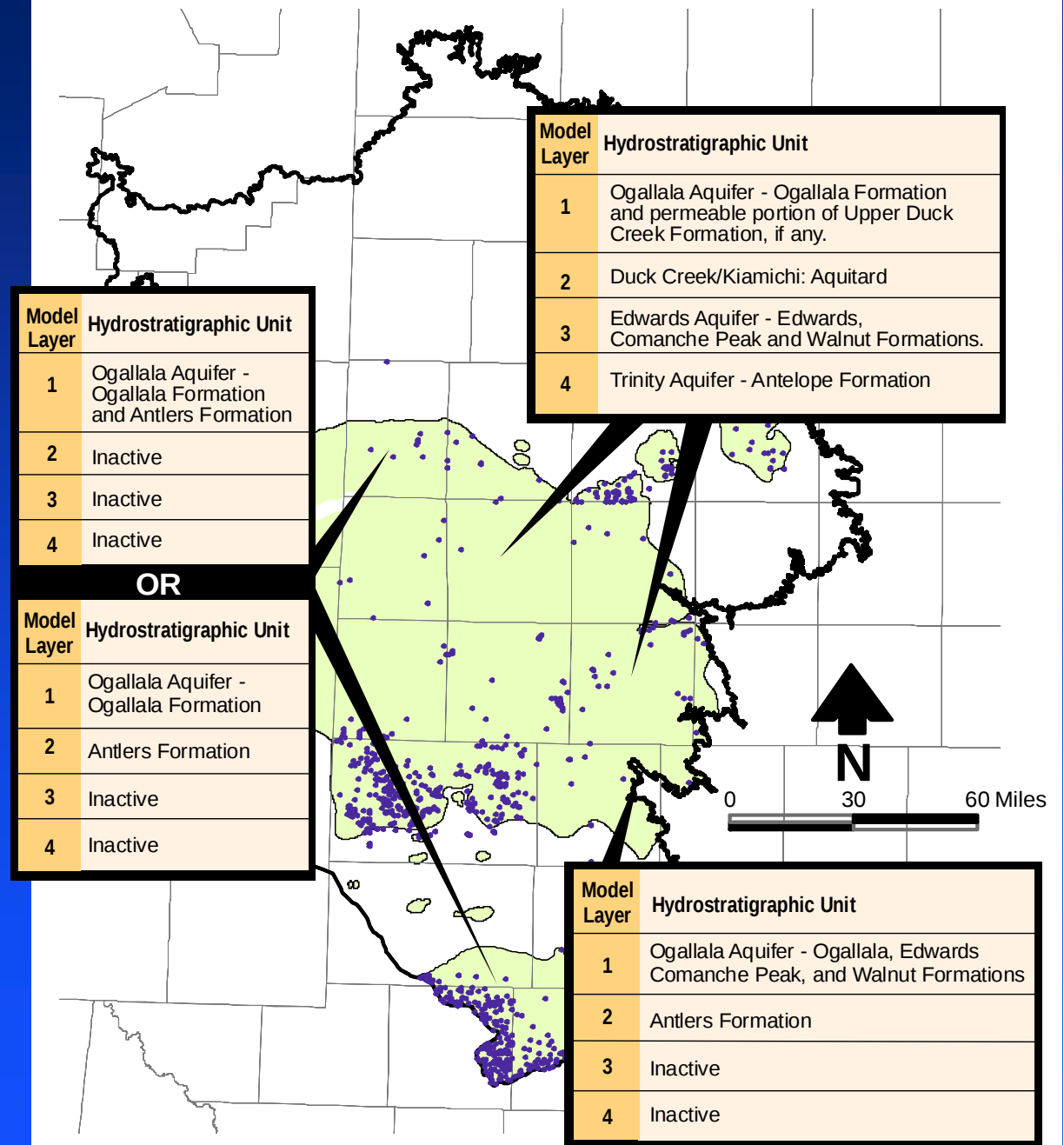
Approach to Model Layers

- Layer 1 - Ogallala and permeable portions of the Cretaceous section in direct hydraulic communication
- Layer 2 - Low-permeability portions of the Duck Creek and Kiamichi Formation
- Layer 3 - Edwards, Comanche Peak and Walnut Formations
- Layer 4 - Antlers Sand

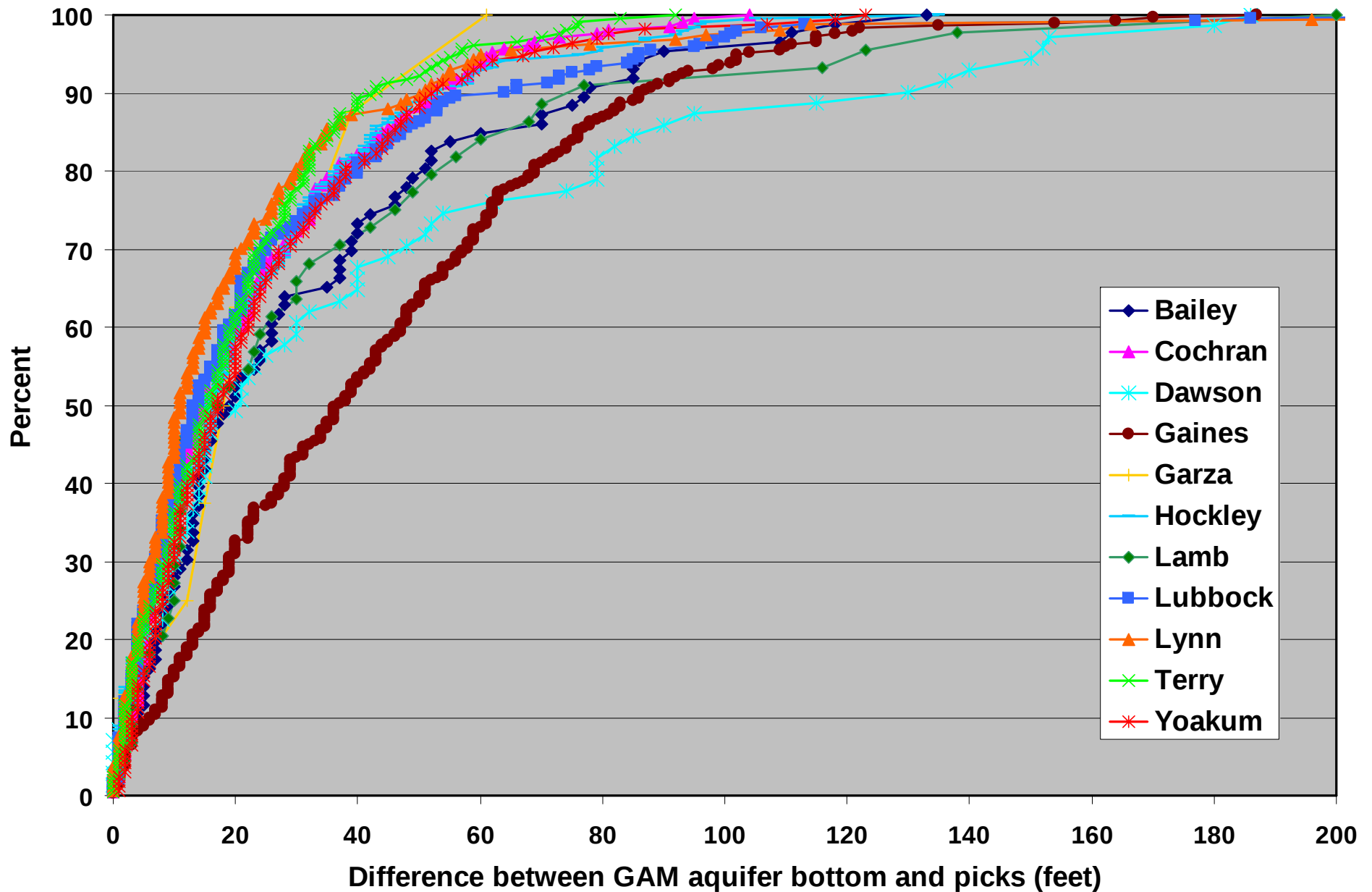


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Model Layering and Edwards Trinity Wells in TWDB Database



Ogallala Base Comparisons



Elevation of Base of Ogallala Formation



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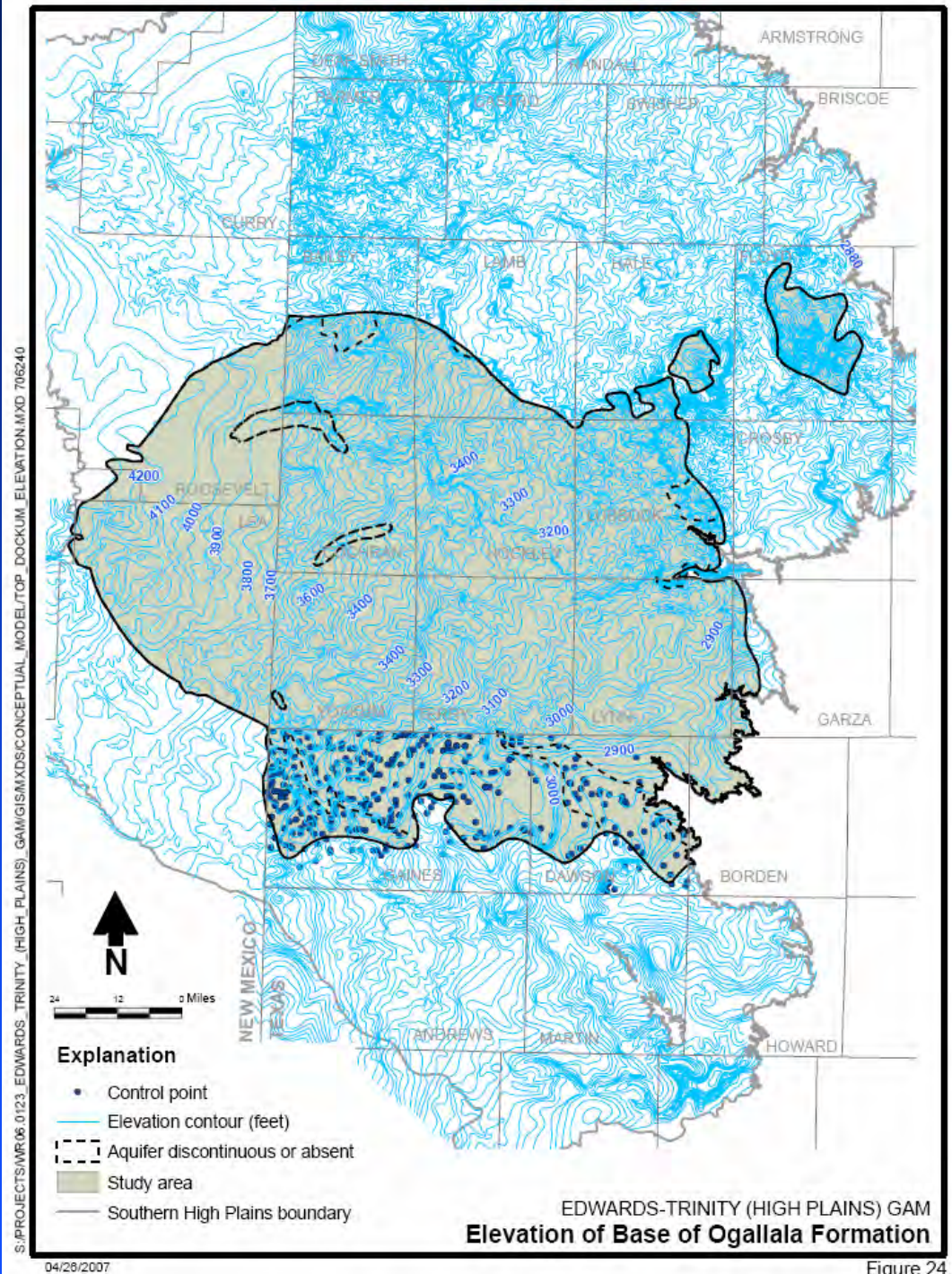


Figure 24

Elevation of Top of Dockum Group



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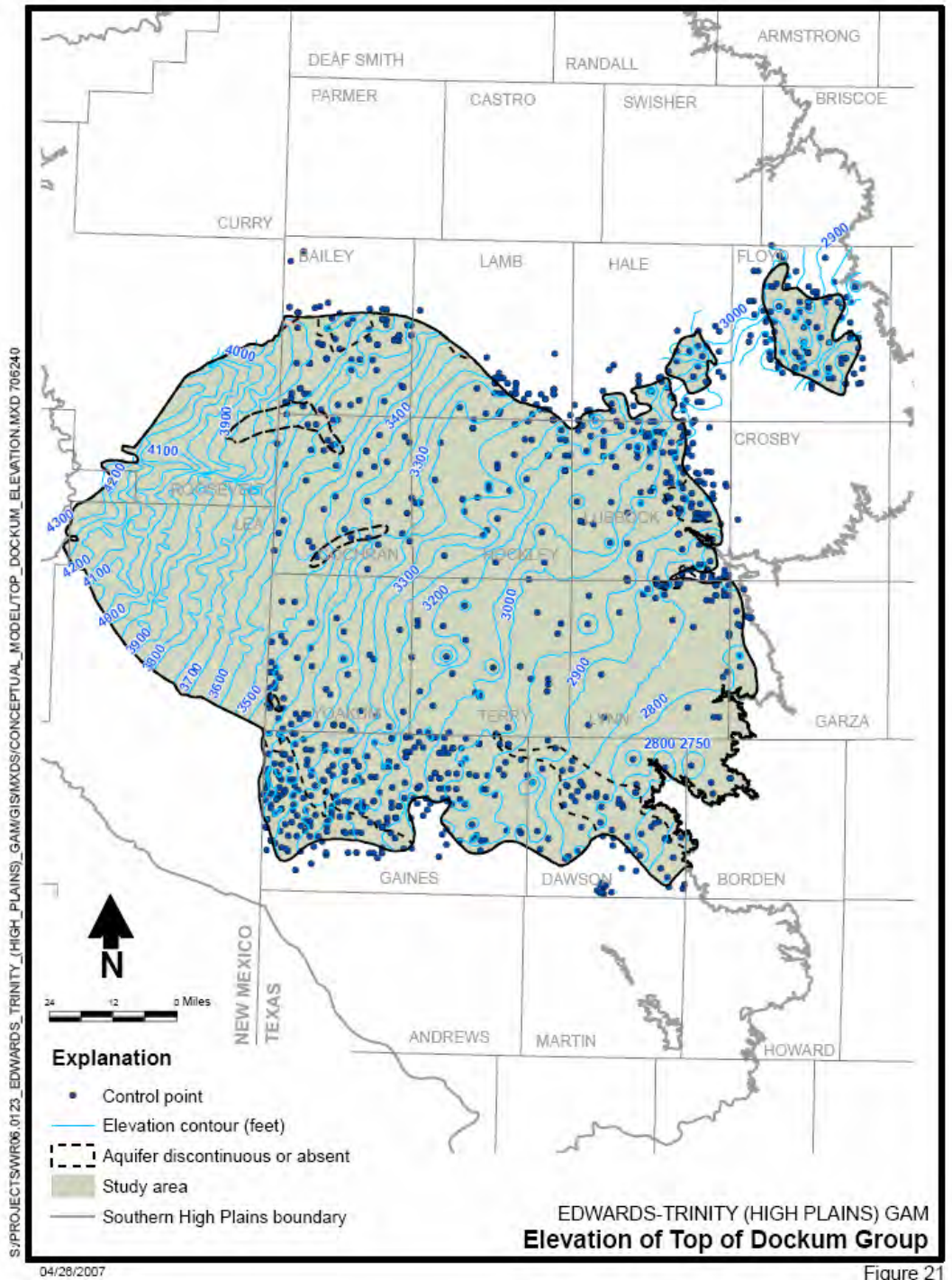
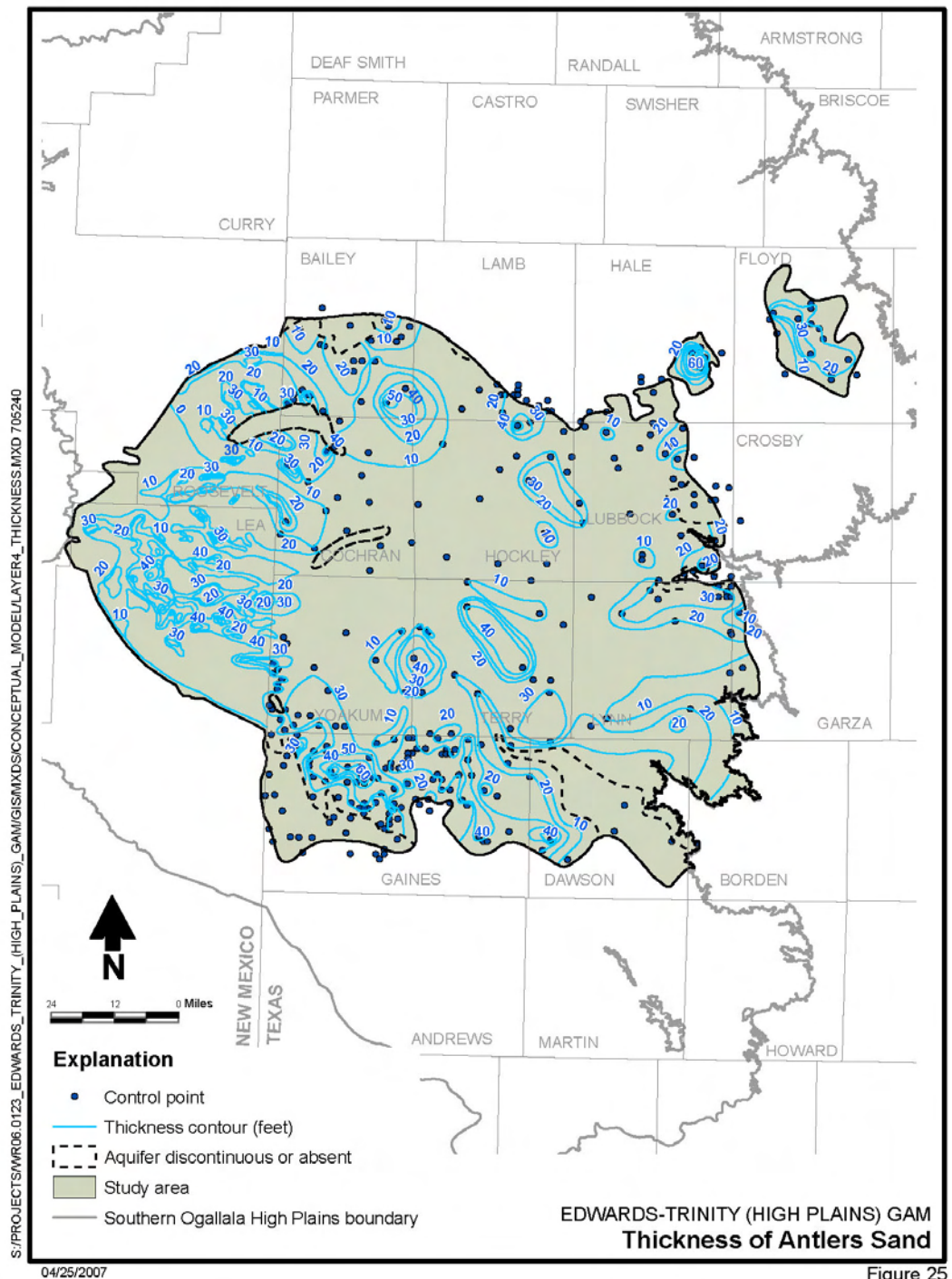


Figure 21

Thickness of Antlers Sand



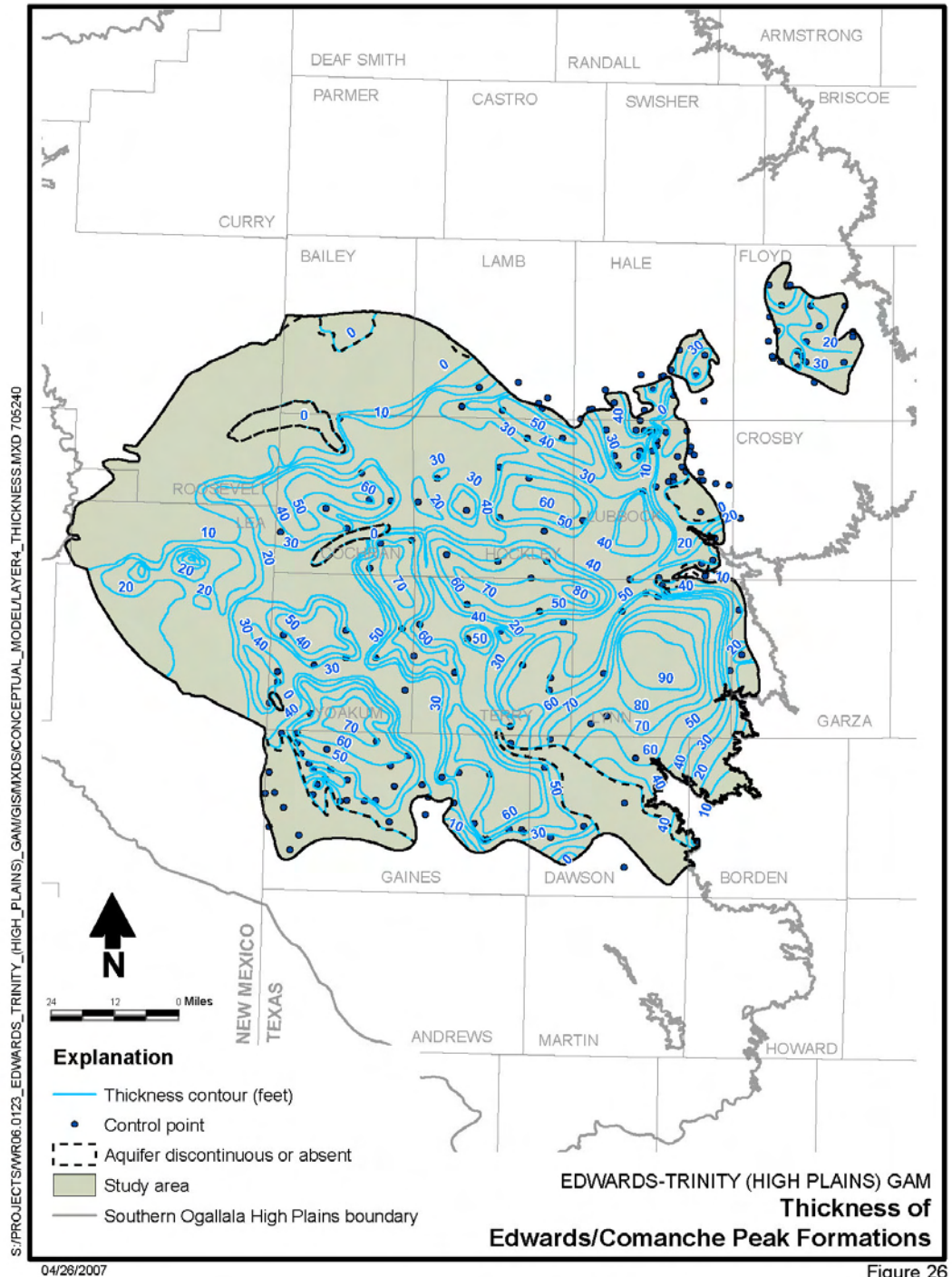
**Daniel B. Stephens
& Associates, Inc.**



Thickness of Edwards/Comanche Peak Formations (Predominately Limestone)



**Daniel B. Stephens
& Associates, Inc.**

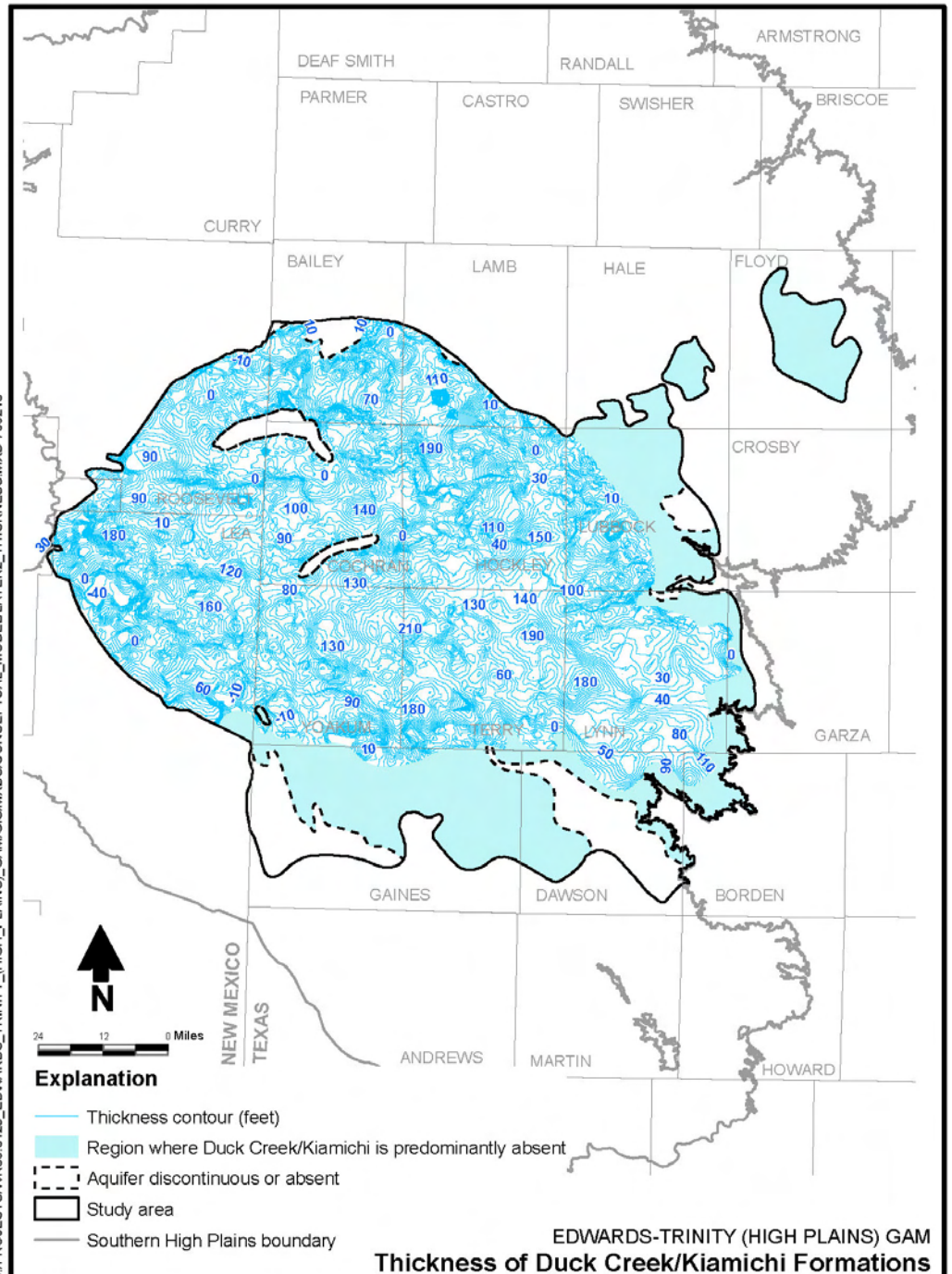


Thickness of Duck Creek/Kiamichi Formations (Calculated)



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S:\PROJECTS\WR06.0123_EDWARDS_TRINITY_(HIGH_PLAINS)_GAM\GIS\MXD\CONCEPTUAL_MODEL\layer2_THICKNESS.MXD 706240



04/28/2007

Figure 27

Hydraulic Conductivity



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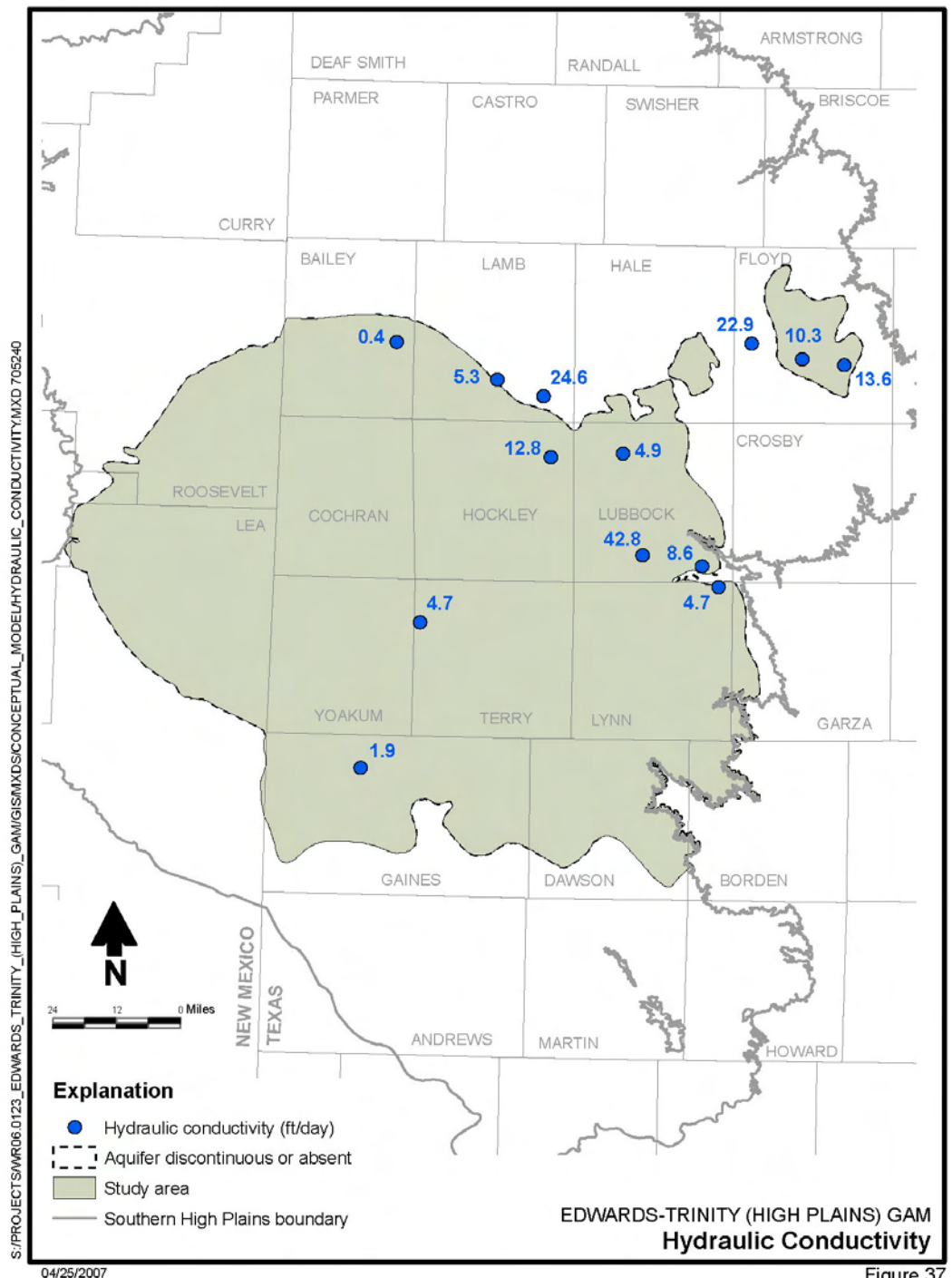
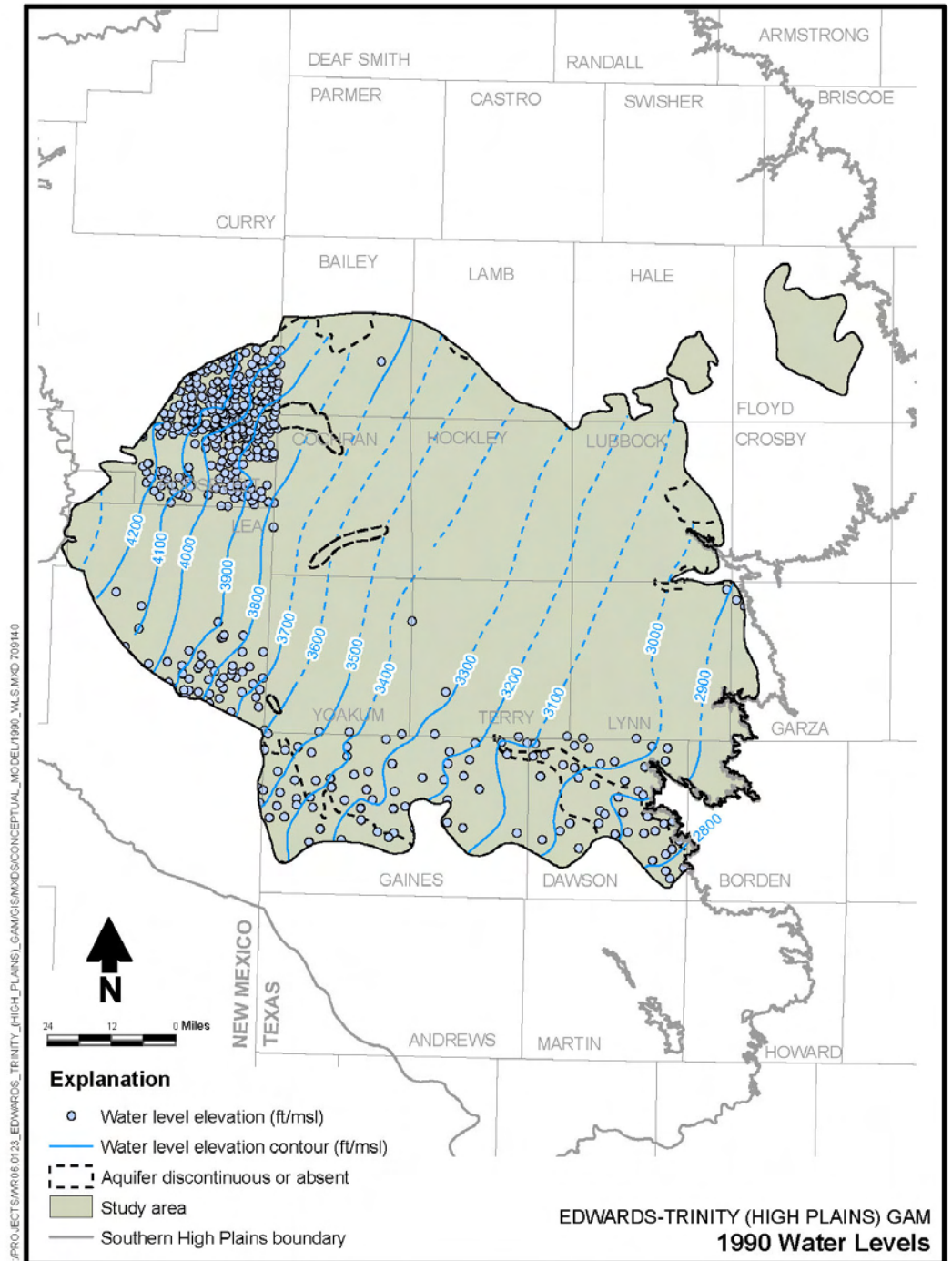


Figure 37

1990 Water Levels



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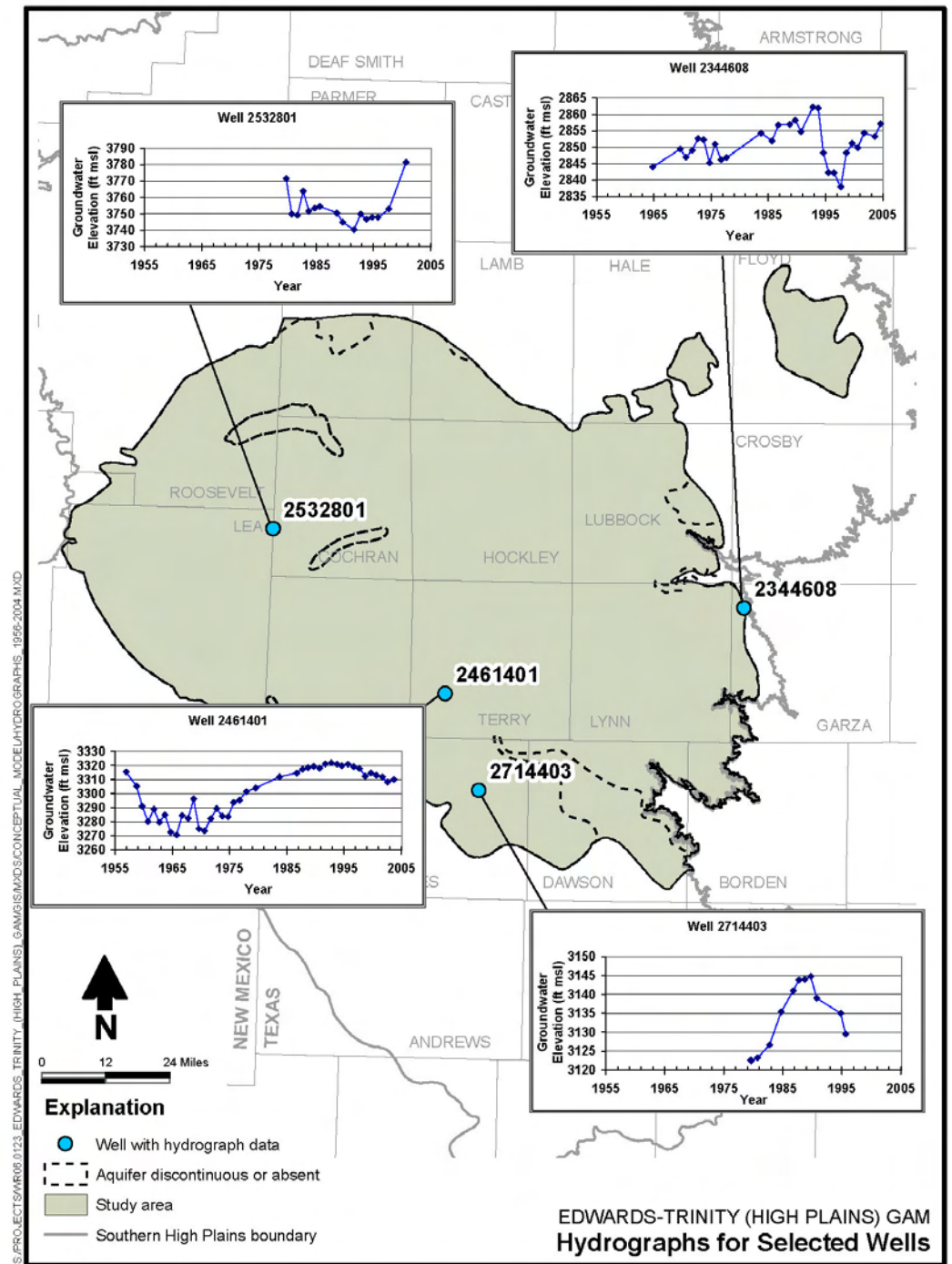
04/28/2007

Figure 30

Hydrographs for Selected Wells



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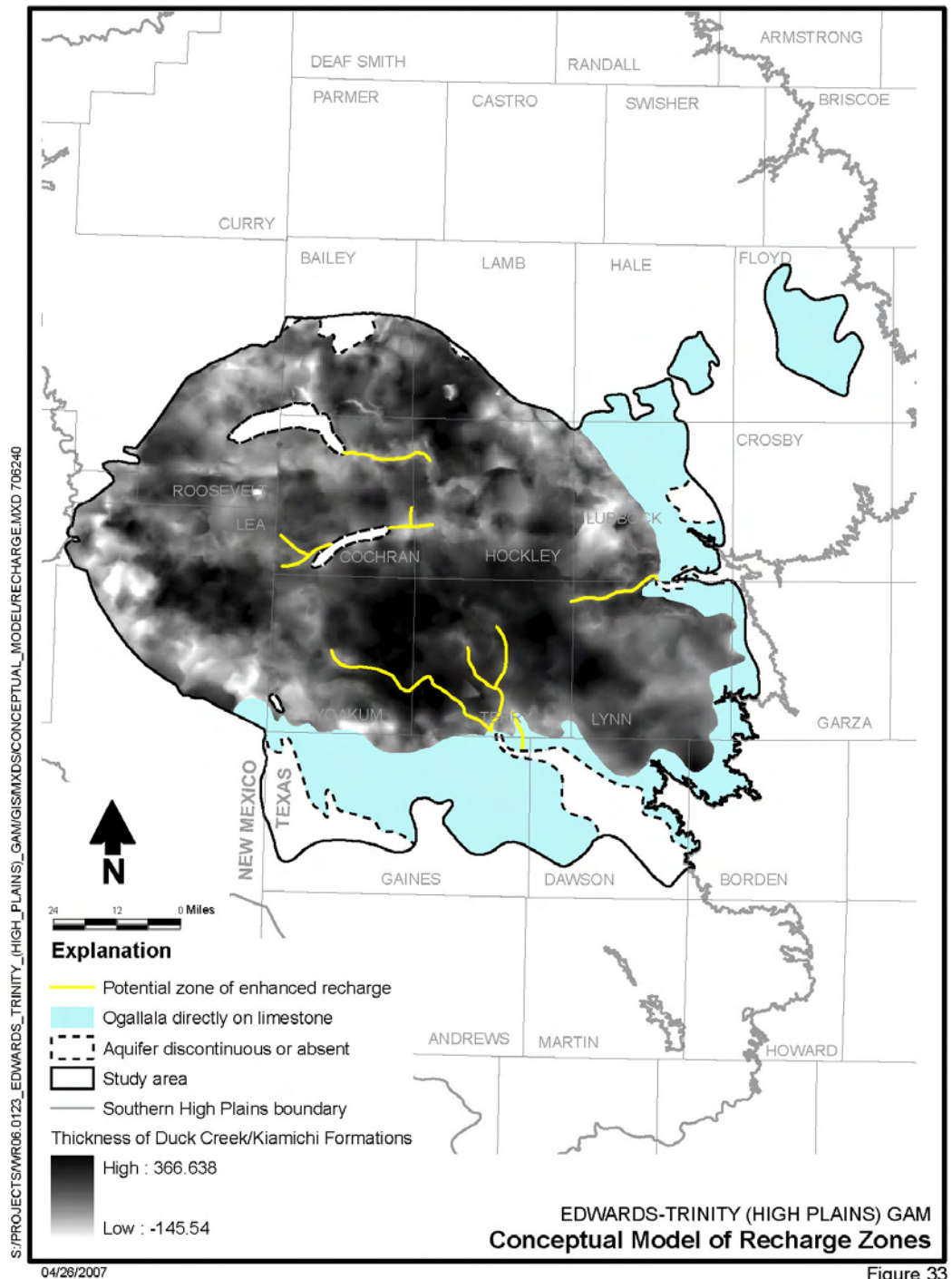
04/25/2007

Figure 32

Conceptual Model of Recharge Zones



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Spring Locations



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& Associates, Inc.**

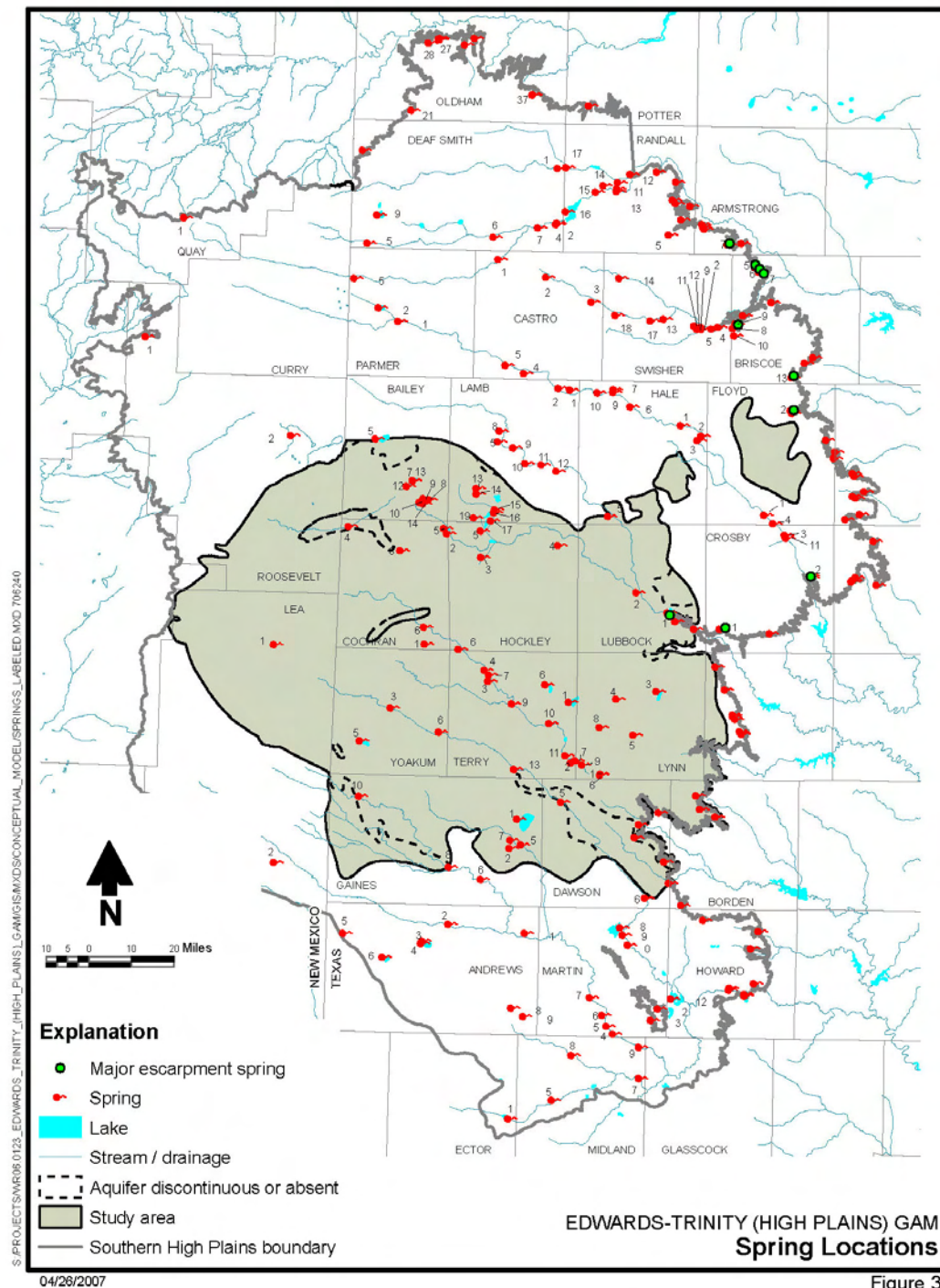
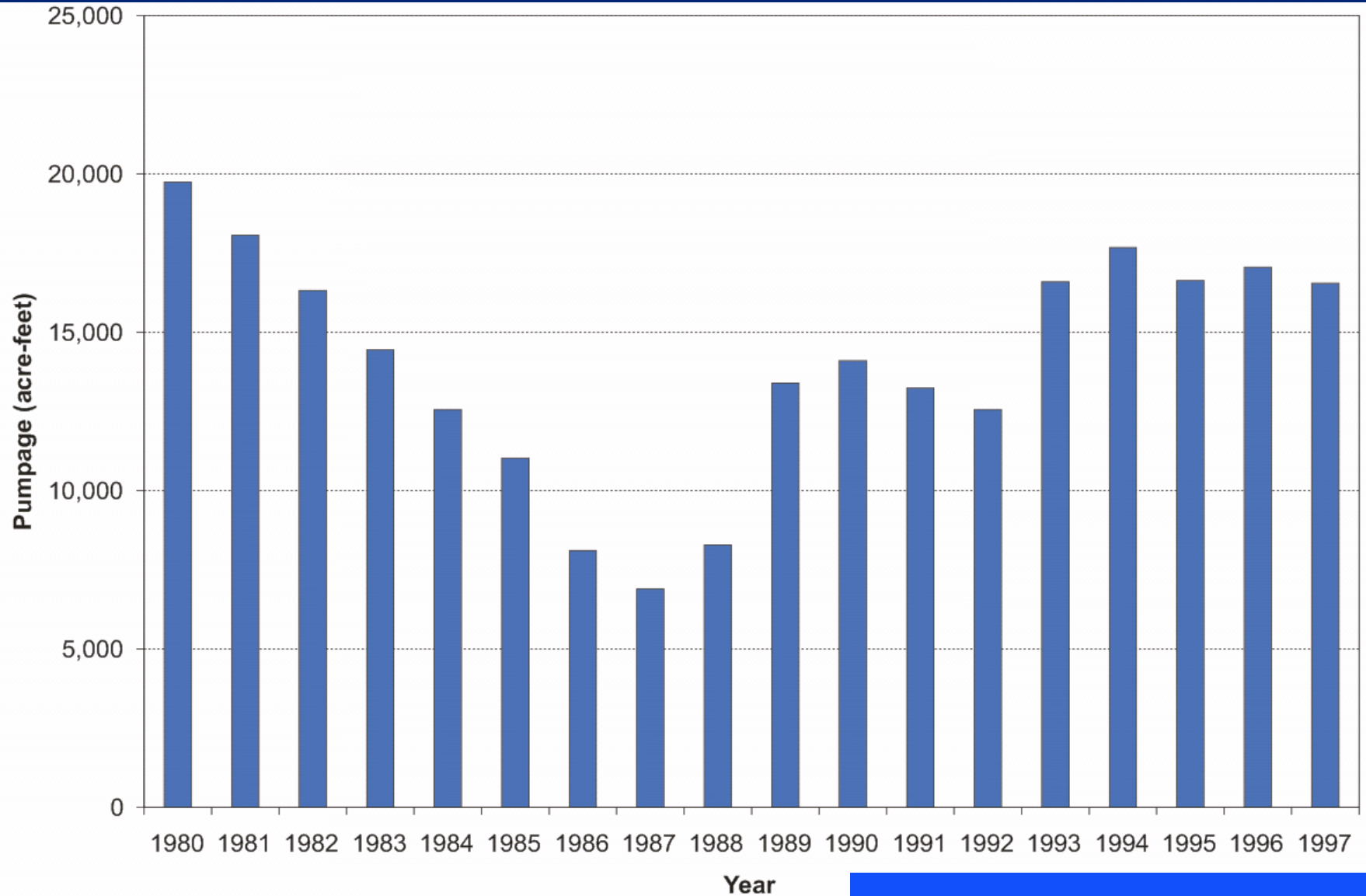


Figure 36

Estimated Historical Groundwater Use



Note: Total pumpage by year.

Land Use with 1994 Irrigated Lands



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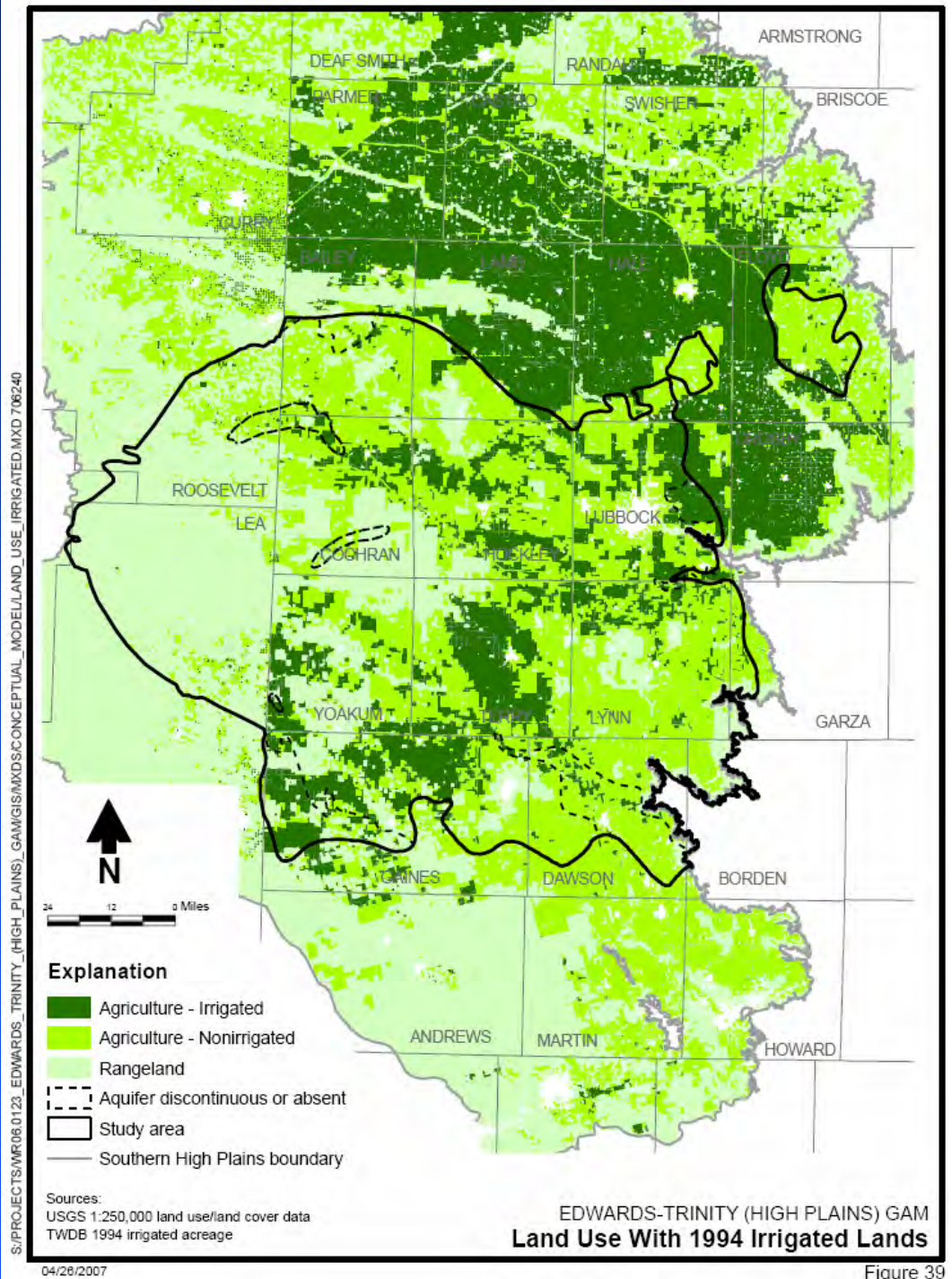


Figure 39

LANDSAT Image Showing Irrigated Acreage



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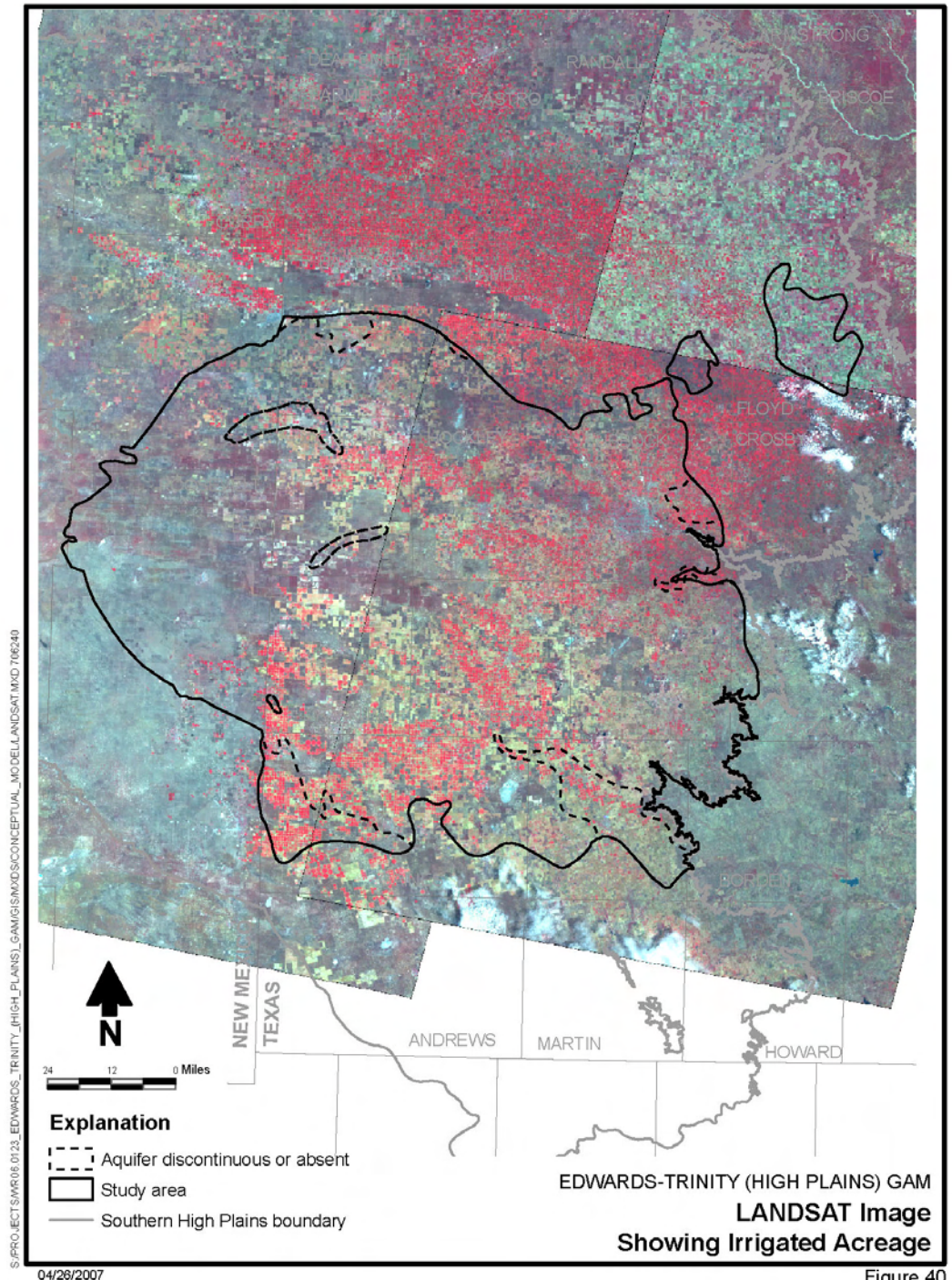
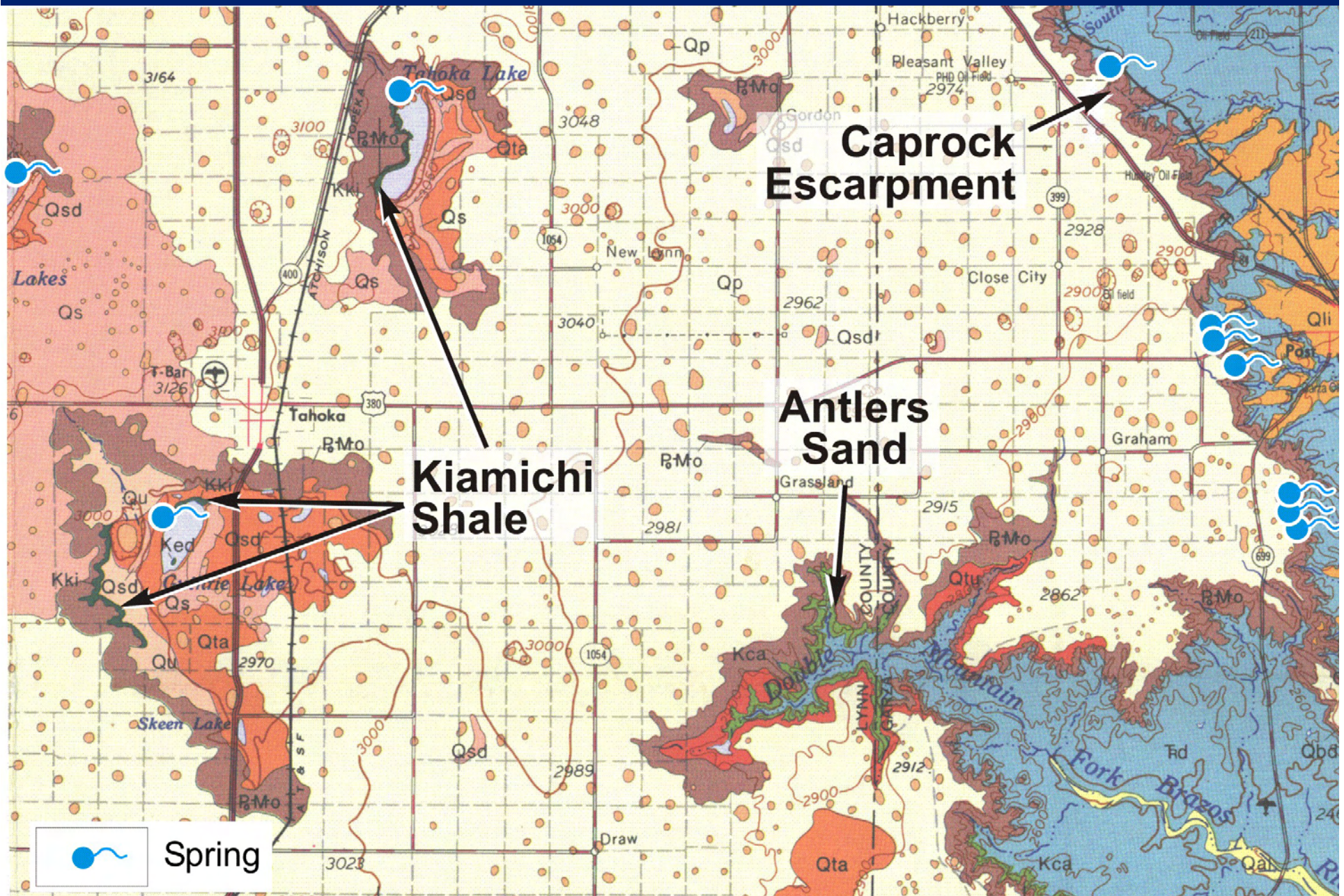


Figure 40

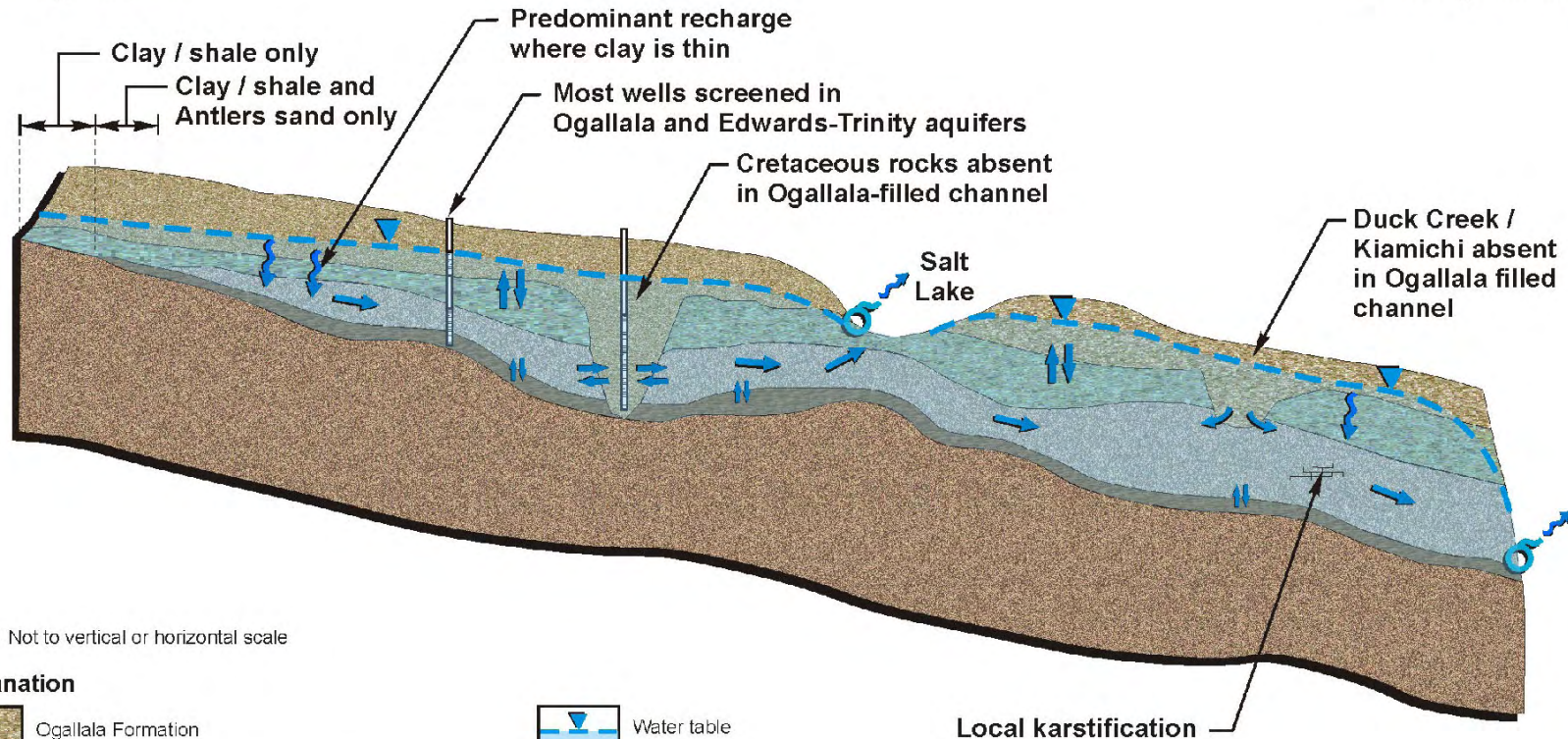
Geologic Map of Central Lynn County



Conceptual Model of Groundwater Flow in the Edwards-Trinity (High Plains) Aquifer

Western Escarpment

Eastern Escarpment



Note: Not to vertical or horizontal scale

Explanation

	Ogallala Formation	} Cretaceous rocks
	Duck Creek / Kiamichi	
	Edwards / Comanche Peak / Walnut	
	Antlers sand	
	Upper Dockum Group (Red Beds)	

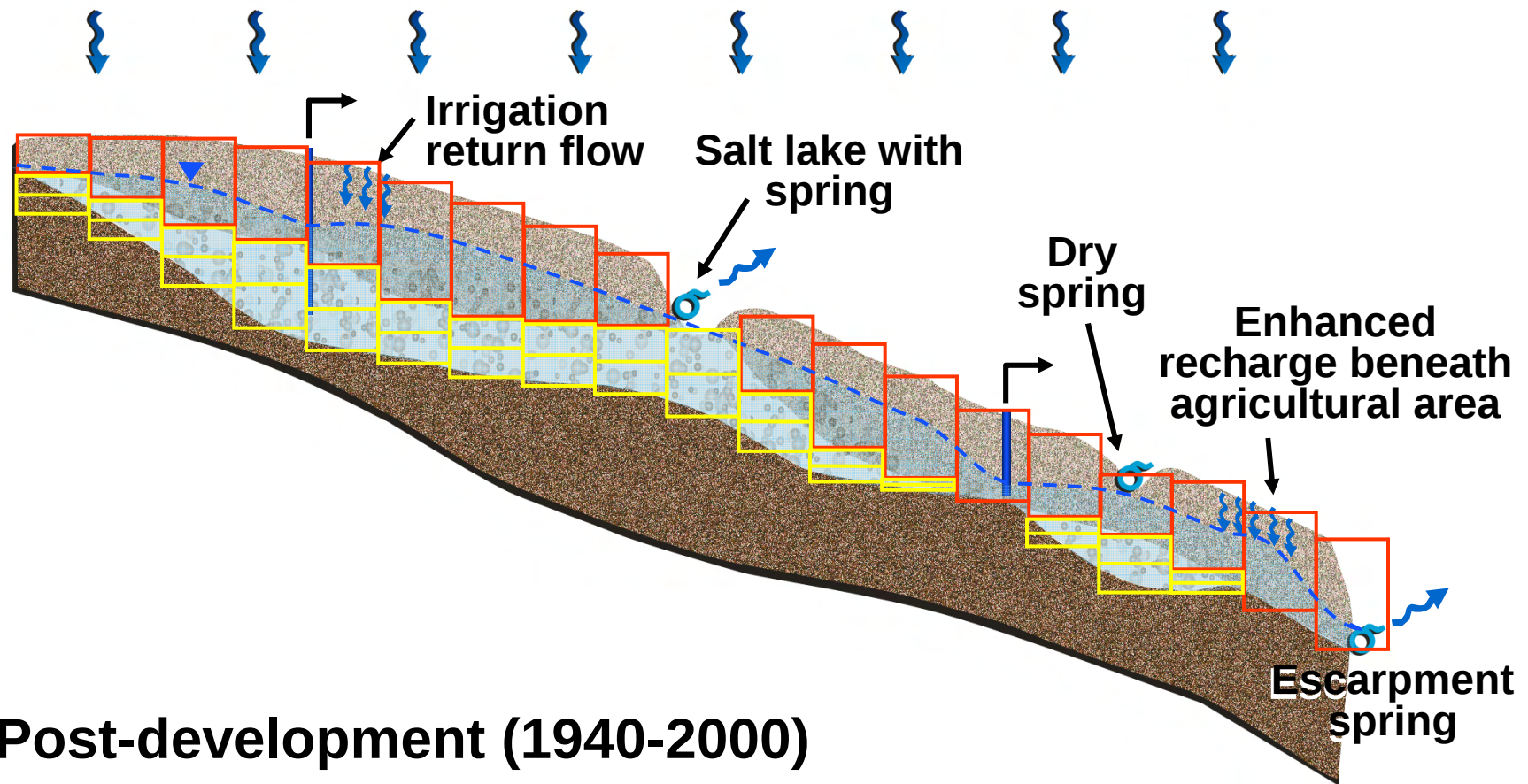
	Water table
	Recharge
	Spring
	Groundwater flow direction
	Leakage between hydrogeologic units

EDWARDS-TRINITY (HIGH PLAINS) GAM
**Conceptual Model of
 Groundwater Flow in the
 Edwards-Trinity (High Plains) Aquifer**

Conceptual Model of Groundwater Flow

West

East



Project Schedule

Task Description	2006	2007	2008
	M J J A S O N D	J F M A M J J A S O N D	J F M A M J J
1 Project management			
TWDB kick-off meeting	▲		
2 Stakeholder communication	■	■	■
3 Data collection			
Conceptual model complete		▲	
4 Groundwater model development			
5 Model calibration			
6 Documentation			
Study completion			▲
Final report deadline			▲

Road Trip?



Edwards-Trinity (High Plains) GAM SAF No. 2

High Plains UWCD No. 1 - Lubbock, Texas

July 11, 2007

Name	Affiliation
Peggy Hunka	TCEQ
Richard Smith	TWDB
Kevin Hopson	DBS&A
Robert Ruggiero	DBS&A
Allan Standen	DBS&A
Neil Blandford	DBS&A
Don McReynolds	HPUWCD No. 1
Scott Orr	HPUWCD No. 1
Jim Conkwright	HPUWCD No. 1
Harvey Everheart	Mesa UWCD
Jason Coleman - field trip only	South Plains UWCD
Mike McGregor - field trip only	Llano Estacado UWCD

**Summary of Questions/Responses from the
Edwards-Trinity (High Plains) GAM SAF No. 2
High Plains Underground Water Conservation District No. 1
Lubbock, Texas July 11, 2007**

Questions directed to Neil Blandford (DBS&A Project Manager) or DBS&A geologists Allan Standen and Robert (Bob) Ruggerio

What percentage of data points fully penetrated to the Dockum?

A relatively small percentage of the entire data set penetrates all the way to the Dockum geologic units. We would need to check the database to determine the exact number.

What do you mean by poor locations?

There were a number of TCEQ identified state well grid locations for drillers' reports (approximately 20 percent of the total evaluated for this project) that were in error when checked against the driller's description of the location. For this reason, the location of every well log was cross checked before it was utilized. Some location discrepancies were relatively minor, and some were substantial (e.g. many miles off). Where there was a discrepancy, the driller's description of the location was used.

Were drillers logs (descriptions) less accurate if location of well was inaccurate?

No, this is generally not the case. Some locations were marked in significant detail by the driller, but were still off in the state grid indicated in the TCEQ files.

How are drillers qualified to make geological designations on the logs?

Drillers' generally do not have formal training, but learn from others in the field. Many drilling companies are family businesses, and training and techniques are handed down through multiple generations. Also, since their livelihood depend on it, most drillers have a good working knowledge of the common geologic formations and stratigraphy of a given region.

Are darker gray areas higher recharge?

No, the darker gray areas on the potential recharge figure are conceptual zones of lesser recharge.

Can you correlate the historic water levels with the observed recharge levels?

Theoretically this could be done, but we do not have a sufficient data set to do so. Such an analysis would require more observed water levels and an idea of groundwater pumping specifically from the Edwards-Trinity (High Plains) aquifer.

I do not know what questions to ask, but all the data looks good.

Comment.

Do you want to elaborate on the karst topography in Lubbock County?

There was a significant amount of karst features (e.g. large voids noted on the well log) noted for the limestone in Lubbock County. It would appear that the karst regions may not be widely interconnected, or the Edwards-Trinity aquifer would be a more significant water supply in this area.

Any karst in northeast Lynn County bordering Lubbock County?

Not anything extensive that we noticed.