

Geological Survey of Alabama Groundwater Assessment Program

Hydrogeologic Characterization and Groundwater Source Development Assessment for Area 2, Southwestern Alabama

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Geological Survey of Alabama Groundwater Assessment Program

- Extreme droughts in recent years have highlighted the need to manage and protect the water resources of Alabama.





Groundwater Importance in Alabama

- 40% of public water supply by volume is from groundwater sources.
- 70% of the geographic area of Alabama is supplied by groundwater sources.



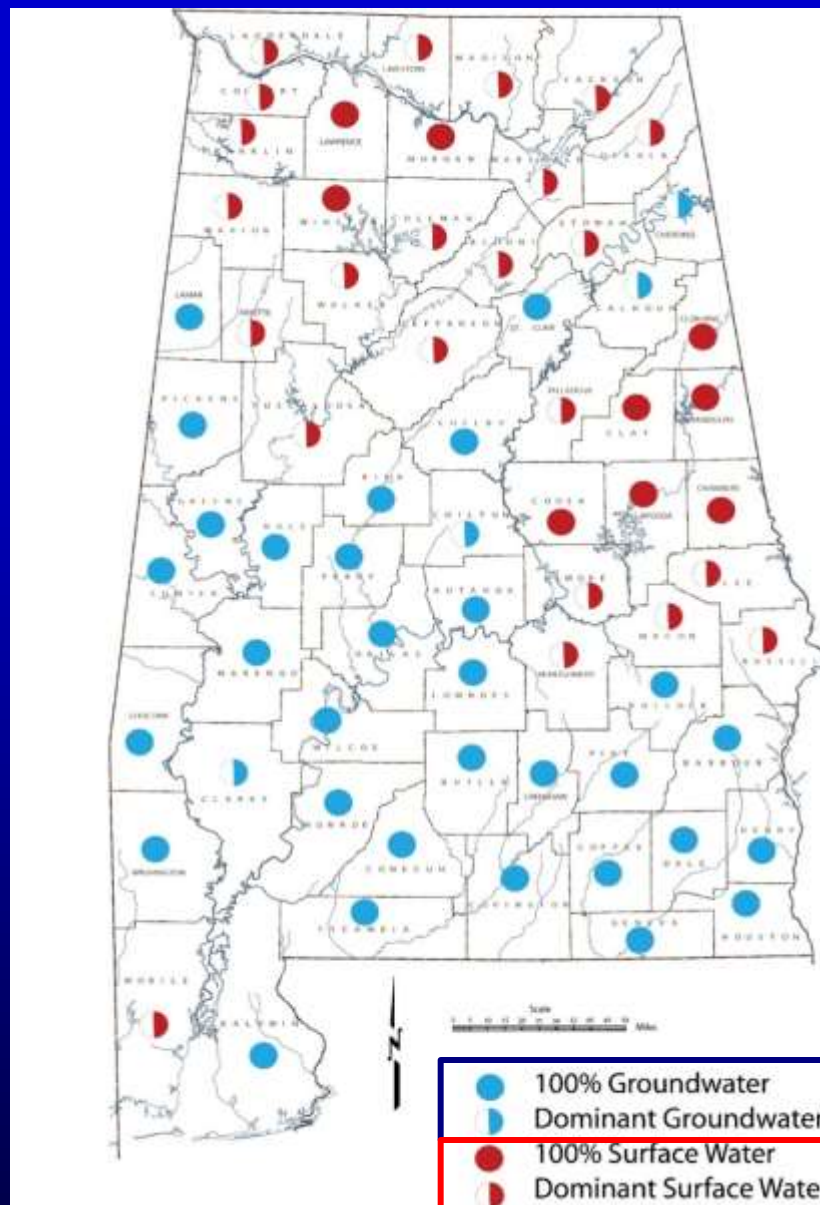
Source of water-use data,

USGS-OWR Estimated Use of

Water in Alabama, 2005

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As part of the statewide comprehensive groundwater assessment initiated by Governor Robert Bentley, the state is divided into 8 areas that will be address separately.





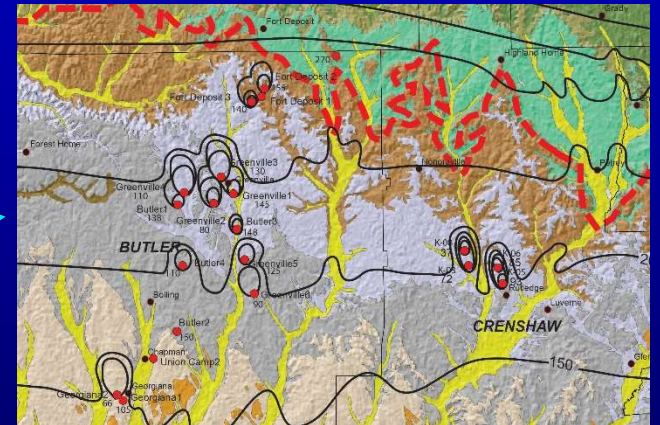
Alabama Groundwater Research

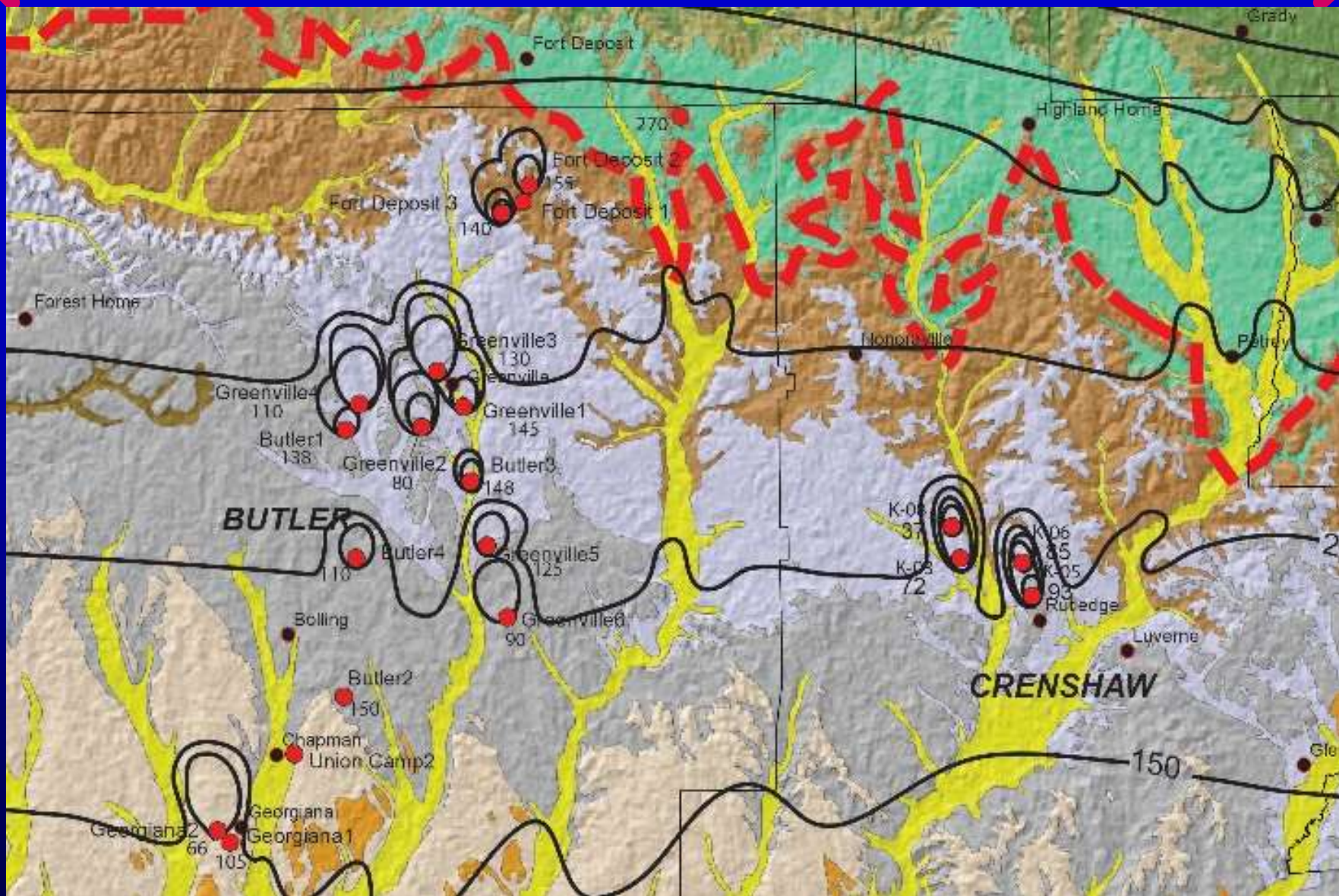
Statewide Groundwater Assessment Area 2



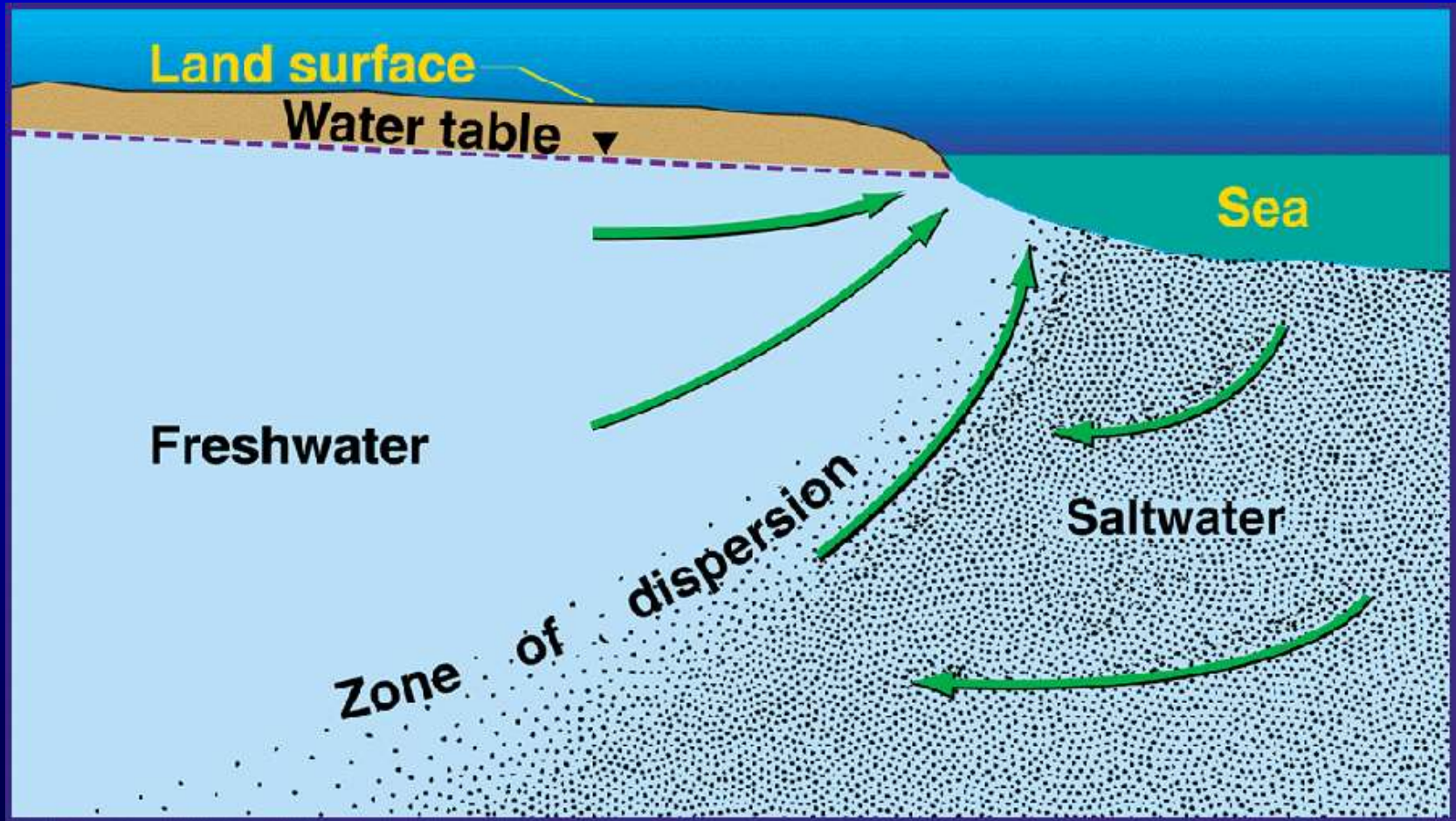


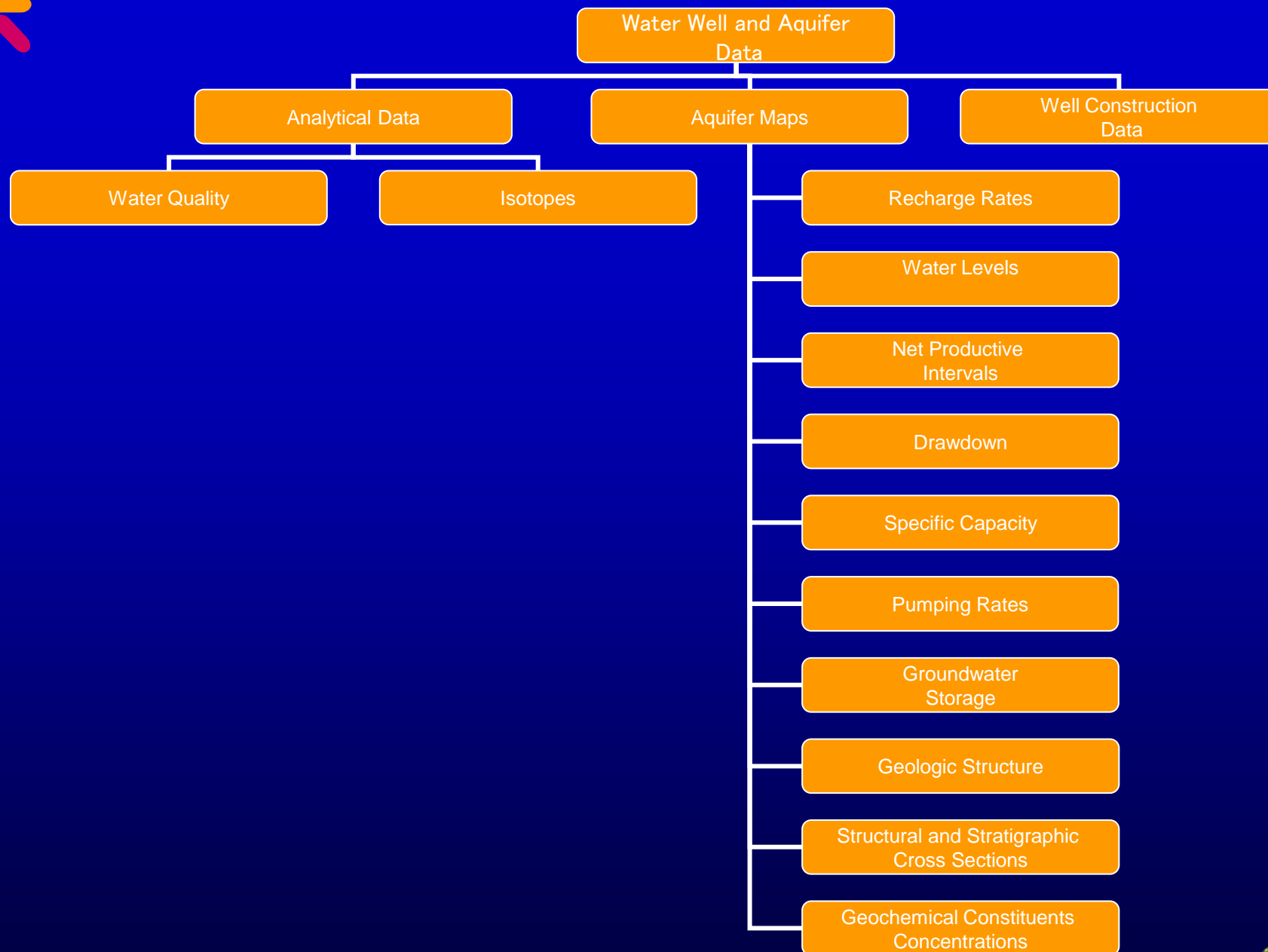
Ripley Aquifer-South Alabama





Saltwater /Freshwater interface impact on water supply







Structural and Stratigraphic
Cross Sections

Net Productive
Intervals





Generalized Stratigraphy Southeast Alabama



Major Aquifers



Minor Aquifers

System	Series	Age Million years before present	Group	Formation
Tertiary	Eocene	36	Jackson	Undifferentiated (including Crystal River Formation)
				Lisbon Formation
			Claiborne	Tallahatta Formation
				Hatchetigbee Formation
	Paleocene	54	Wilcox	Tuscaloosa Sand
				Nanafalia Formation
				Salt Mountain Limestone (subsurface)
			Midway	Porters Creek Formation
				Clayton Formation
				Providence Sand
Cretaceous	Upper	65	Selma	Ripley Formation (including Cusseta Sand Member)
				"Selma Group Chalks"
				Blufftown Formation
			Tuscaloosa	Eutaw Formation
				Gordo Formation
				Coker Formation
	Lower	96		Lower Cretaceous undifferentiated
		135		





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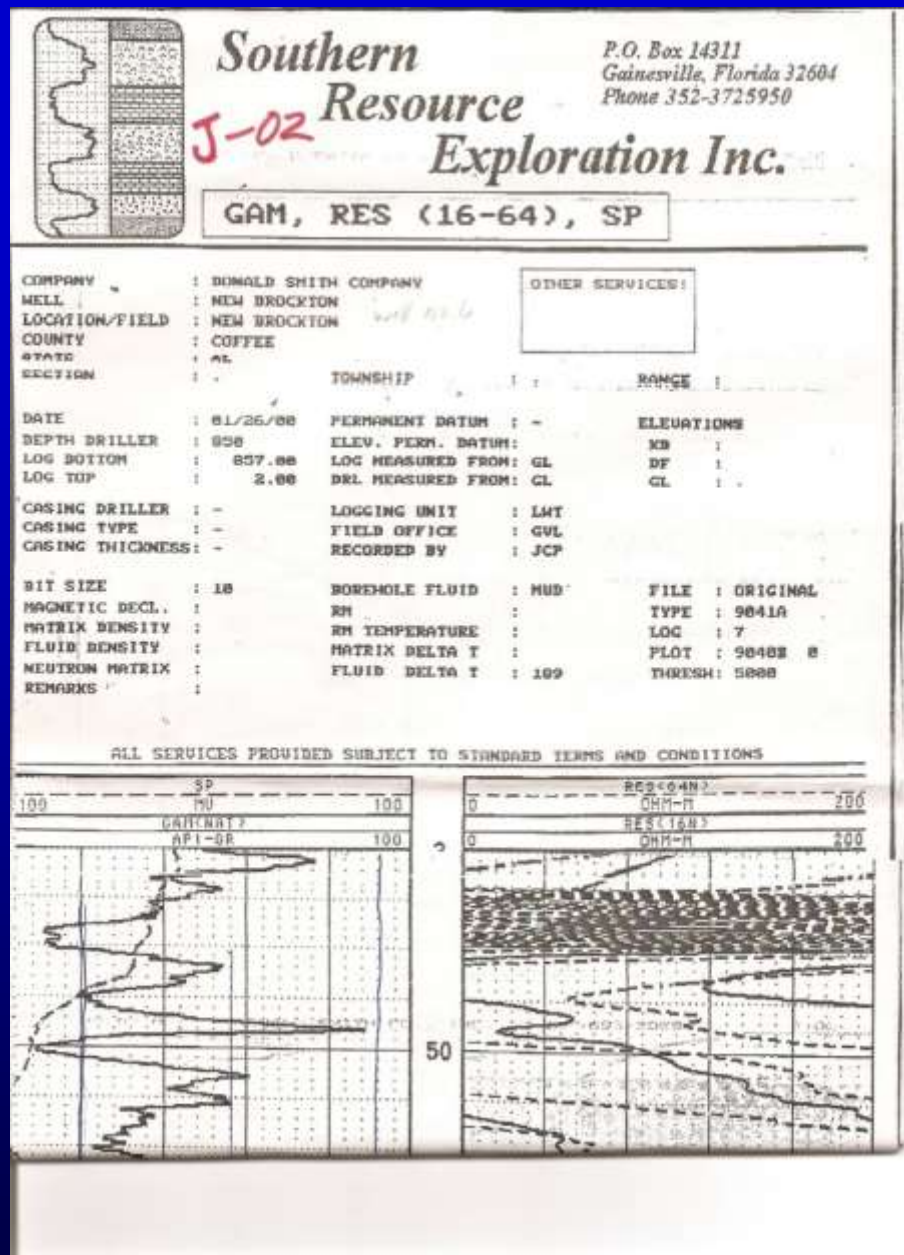
- GSA GAP has a large water resource data set including hydrogeologic research, water well records (more than 125,000), and geochemical data dating to the early 1900's.





Assessment Tools

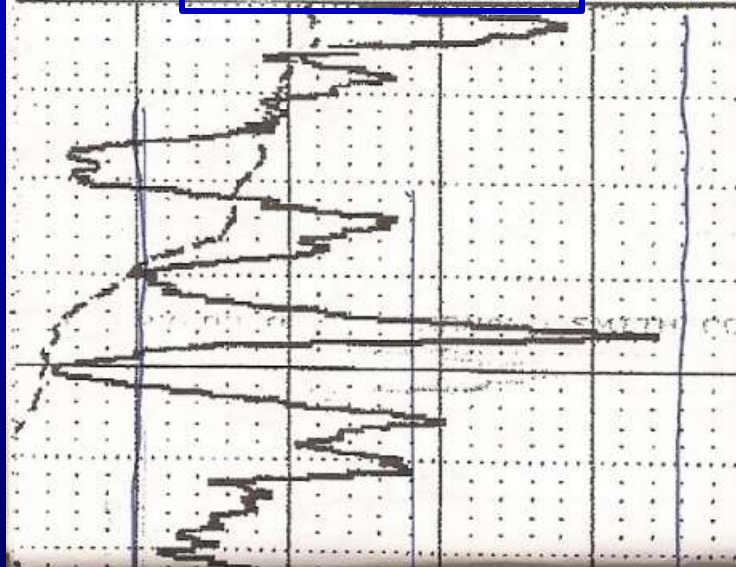
Geophysics



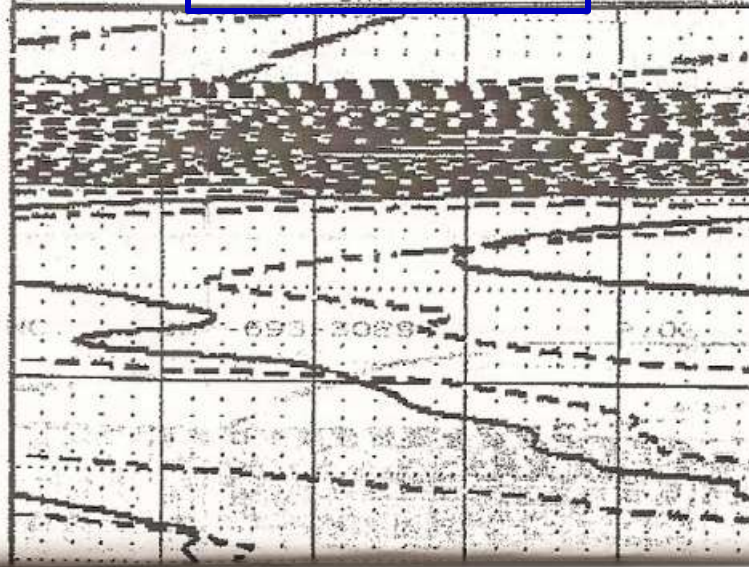
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NEUTRON MATRIX	:	FLUID DELTA T	: 189	THRESH	: 5000
REMARKS	:				

ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

100	SP	100
	MU	
	GAM(NAT)	
	API-GR	100



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	OHM-M	
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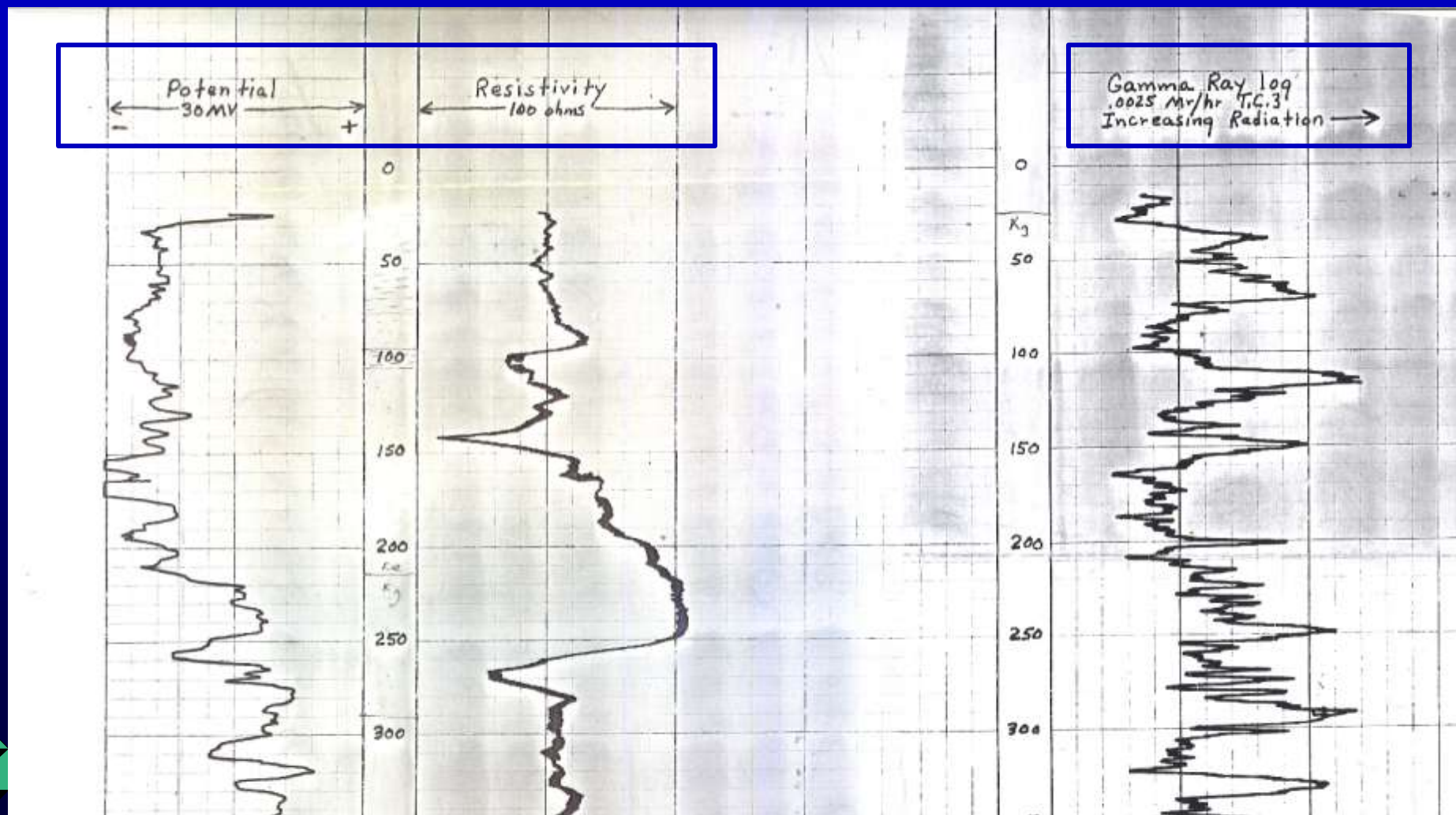


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Water Well Geophysical Logs



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- Oil and Gas Board (OGB) has a large data set including well records (more than 17,000). These data are critical to Alabama's water future and will be effectively managed using the GSA RBDMS-ENV (Risk Based Data Management System-Environmental) database.



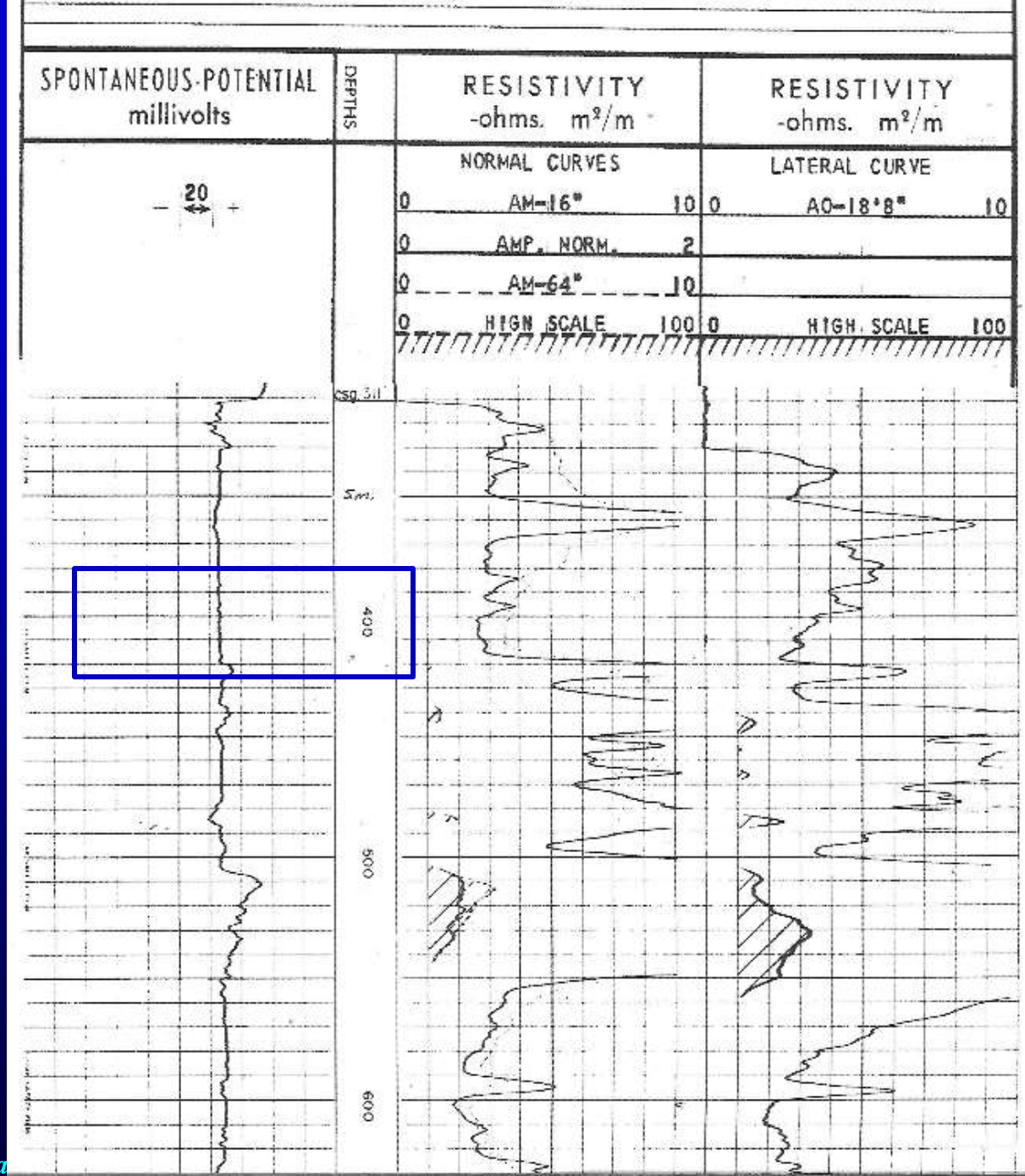
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- GSA RBDMS-ENV database is under construction and will be launched soon on the GSA website.
- It will include all the water wells records and links to the Oil and Gas Board wells.



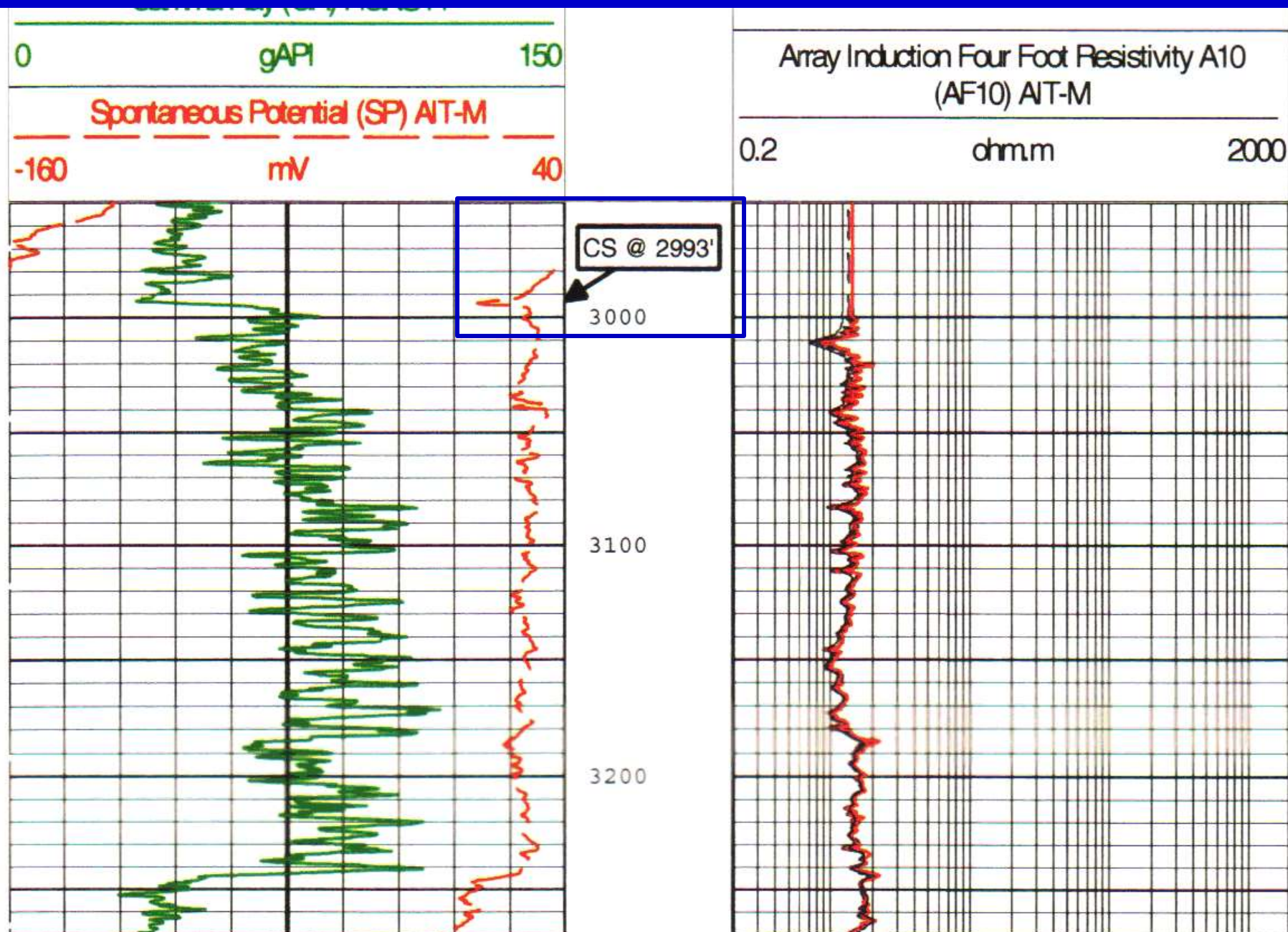


Oil and Gas Well Geophysical Log





Oil and Gas Well Geophysical Logs





Cross Sections

- For each cross-section, a horizontal scale of one inch equals one mile and vertical scale of one inch equals 200 feet was chosen (vertical exaggeration 26.4 x).



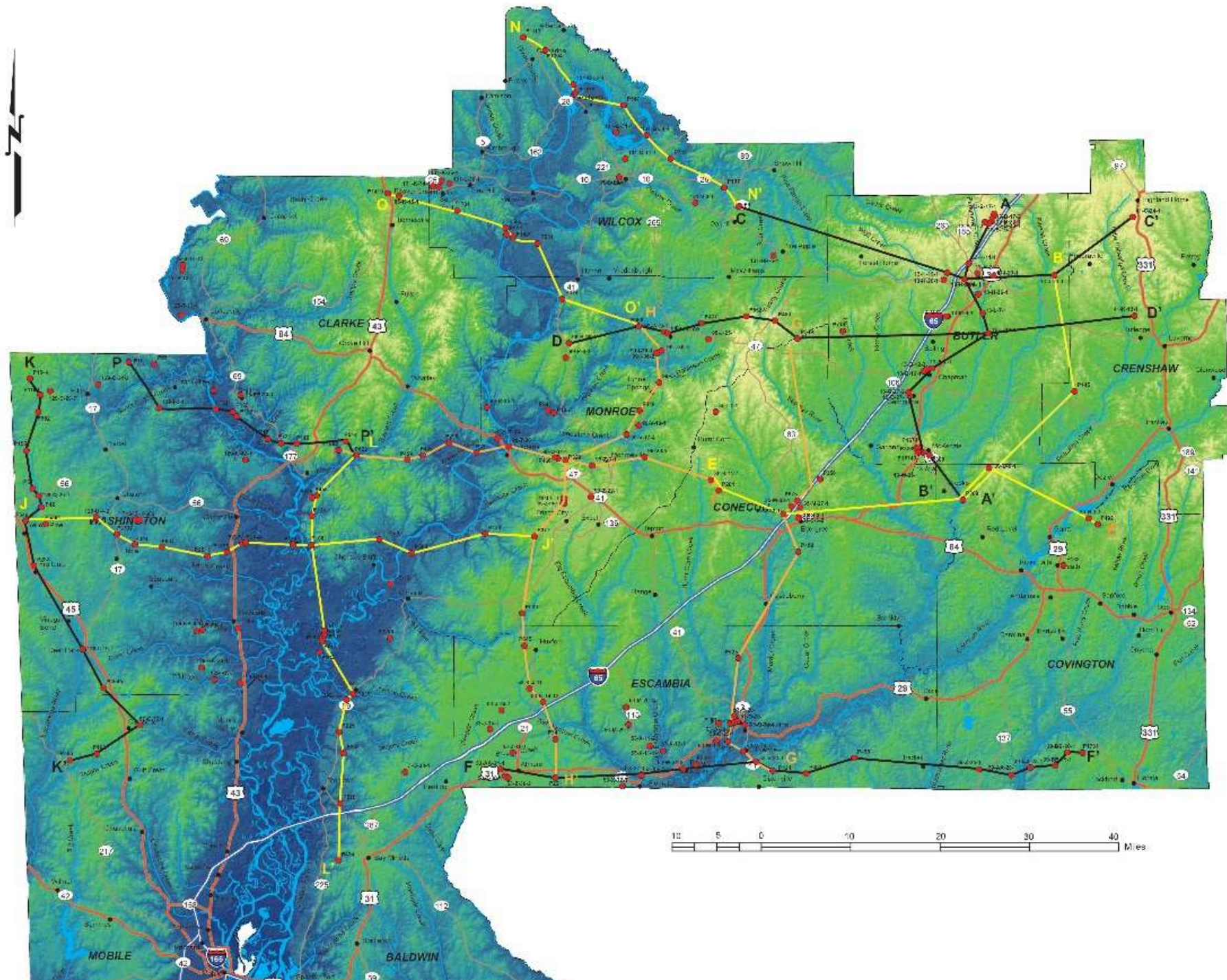


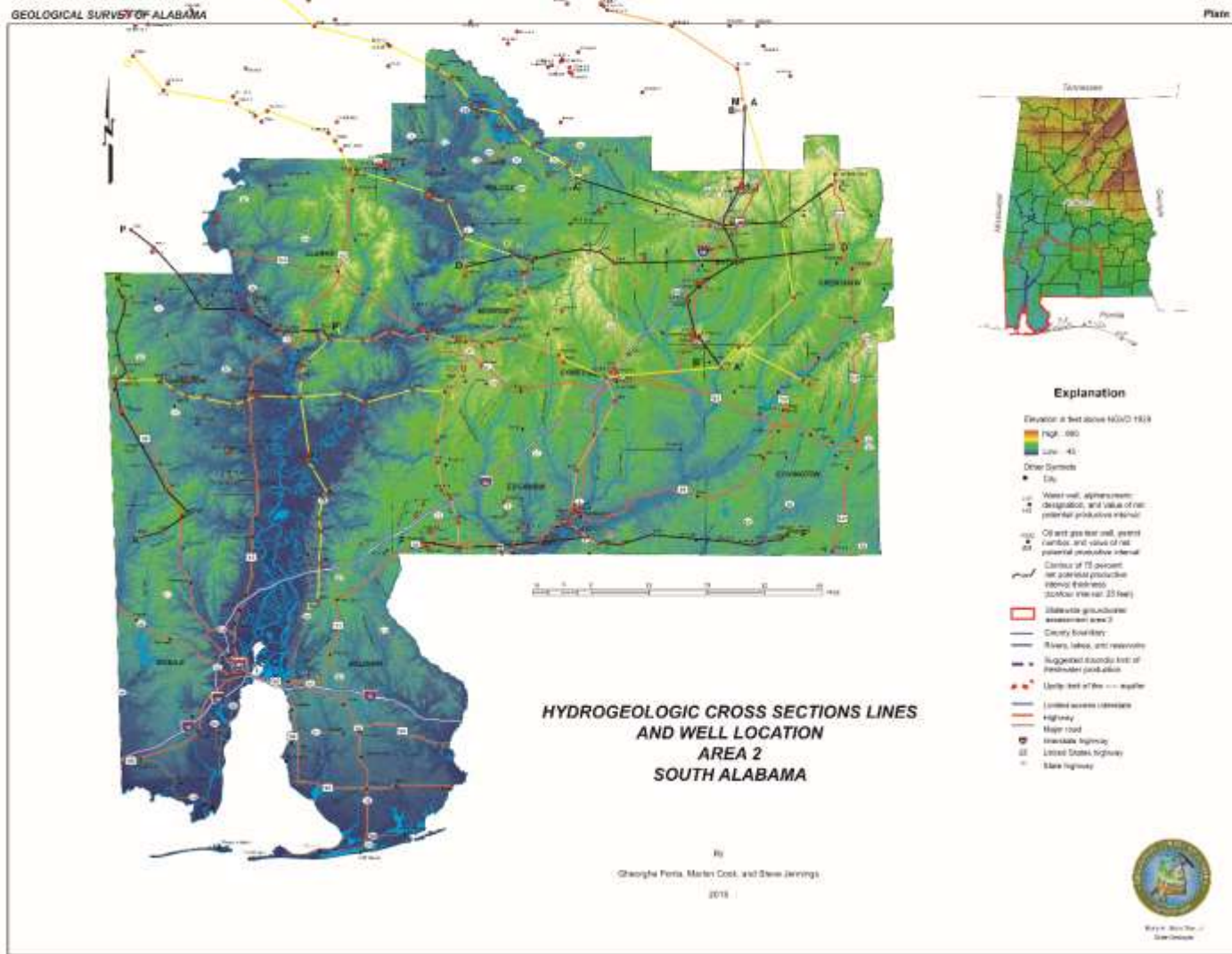
Cross Sections

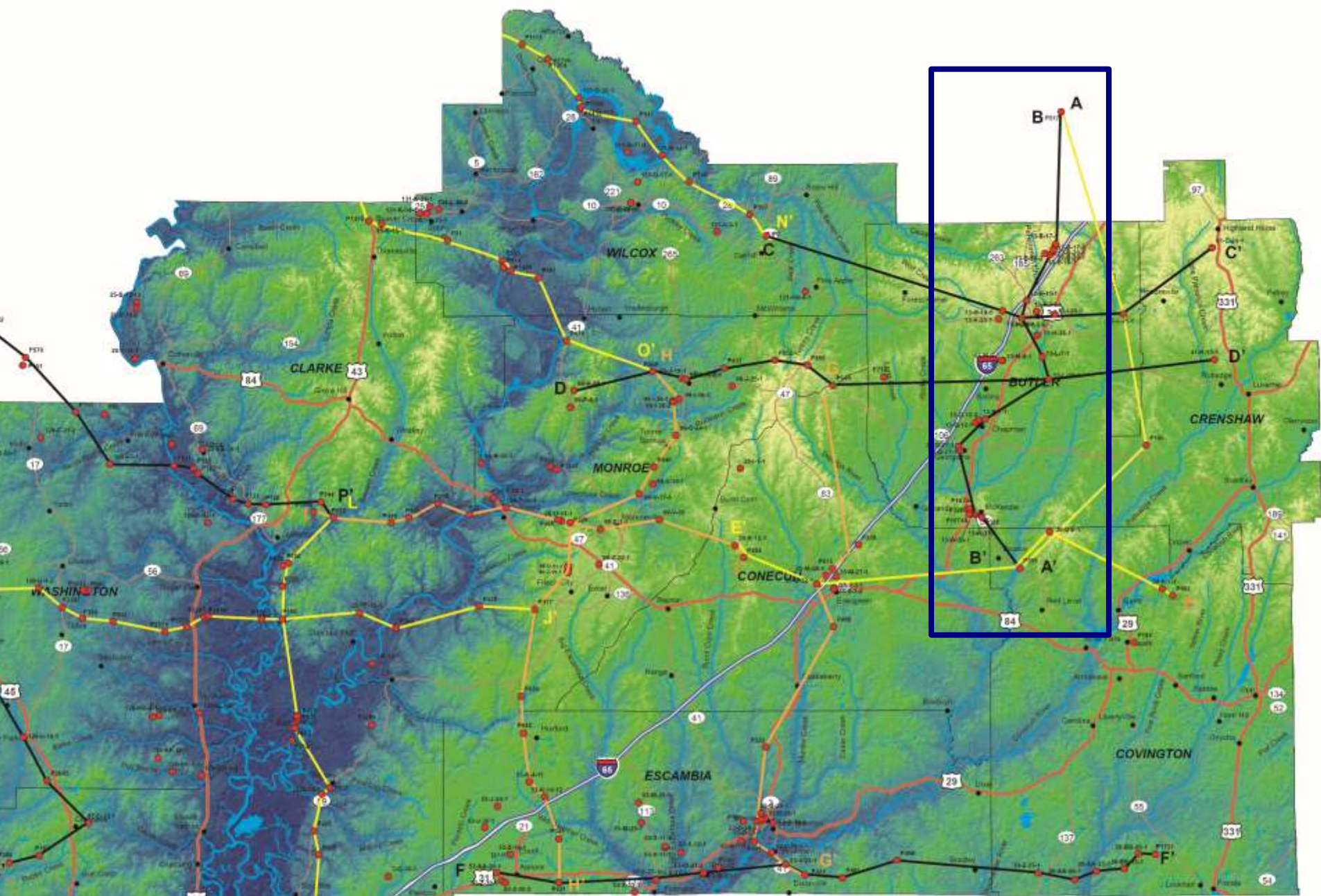
These cross sections are used to identify:

- geologic structure
- aquifers (depth and elevation) and their production intervals
- planning the exploitation of the aquifers, and determining where deeper aquifers might be located.

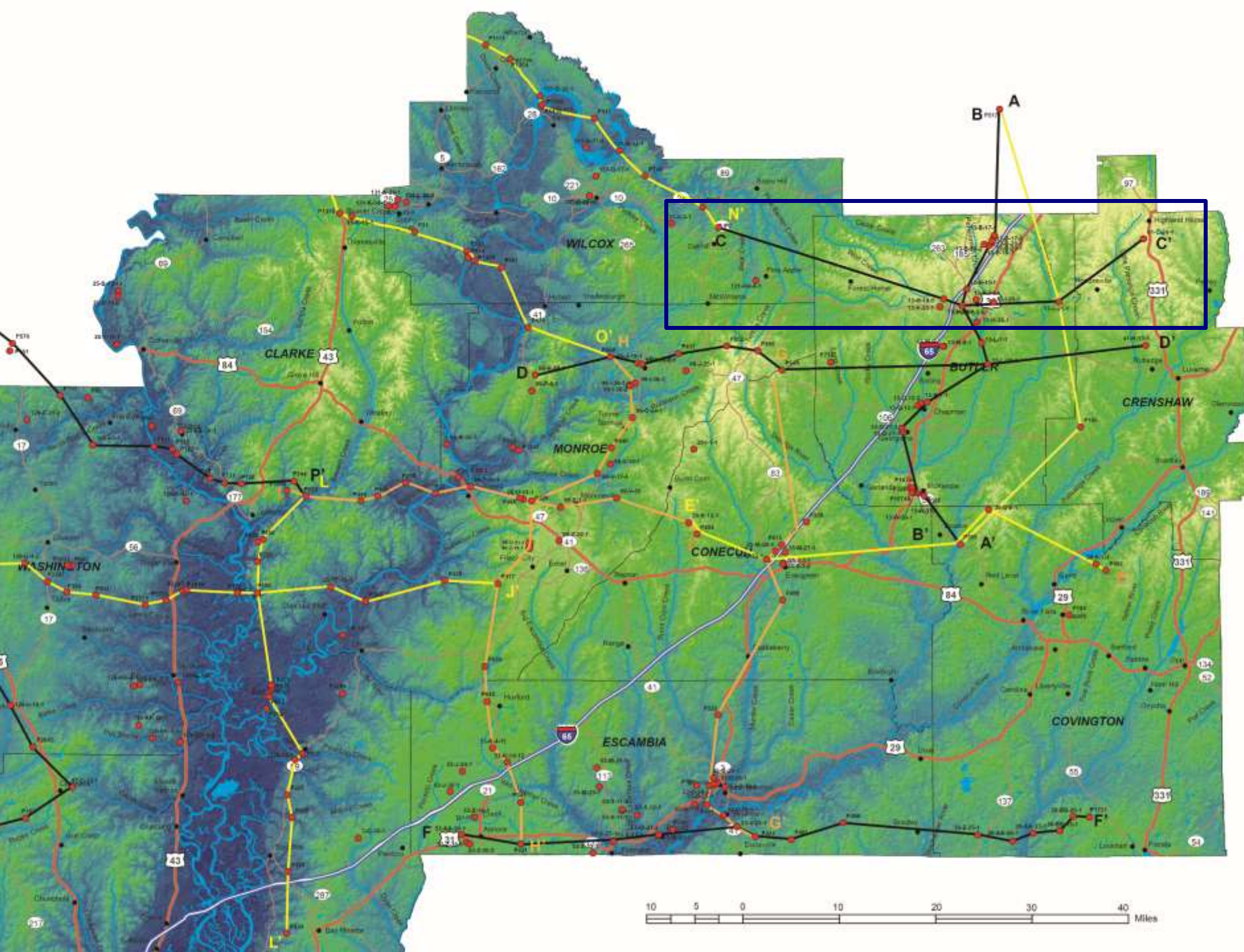




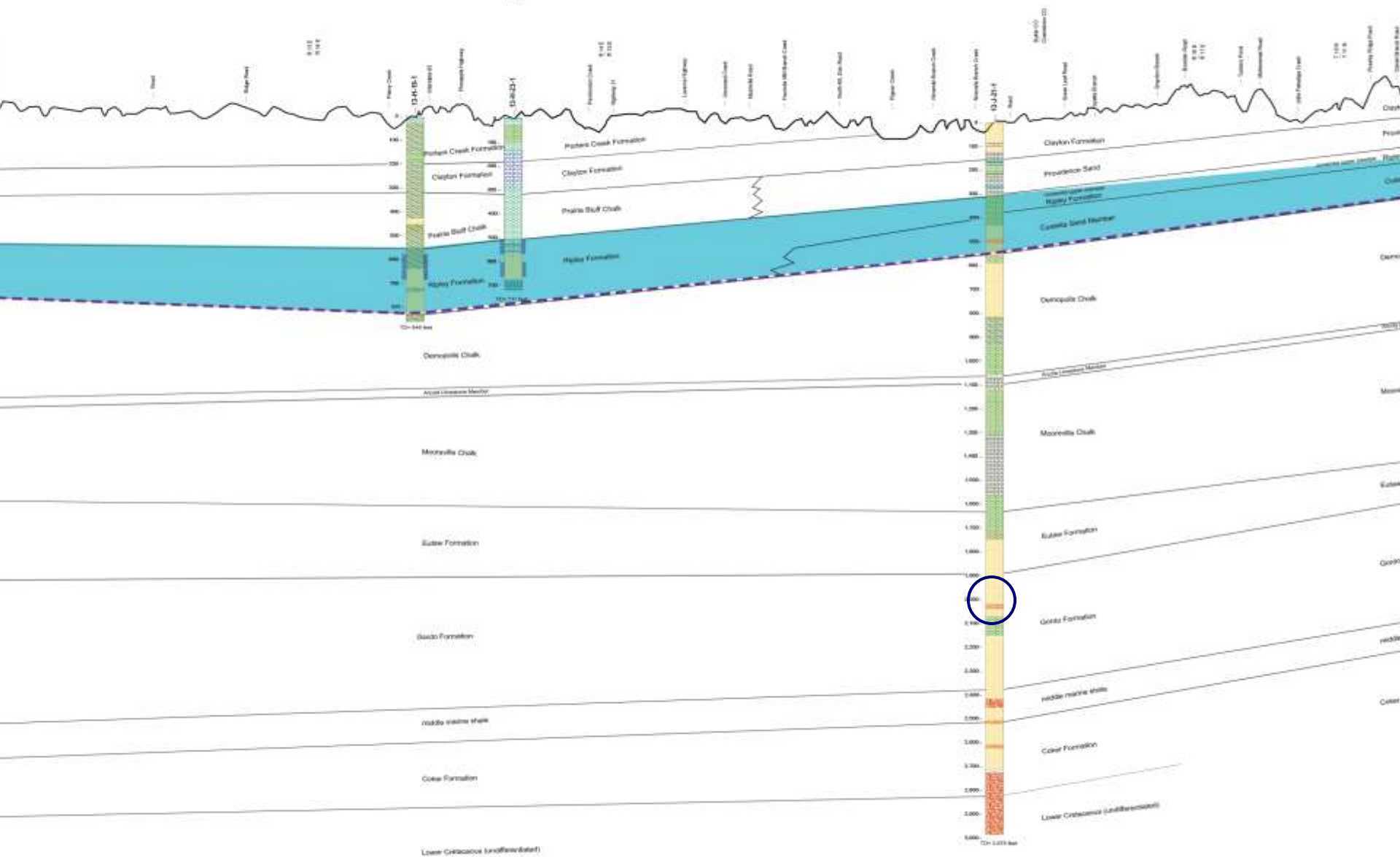








A-A'
BROAD
SECTION



by
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2014

Graphics by: Gheorghe Ponta



Net Potential Productive Interval Map

- The Net Potential Productive Interval (NPPI) map, is based on the geophysical well logs for delineation of sand and limestone beds and determination of their thicknesses.
- Measurements of the natural gamma radiation (gamma ray logs) in subsurface sediments, combined with resistivity and spontaneous potential (SP) logs, are the principal means of determining the presence and thicknesses of sand and limestone intervals in formations penetrated by boreholes.




$$\sum_{75\%} = 74 \text{ ft}$$




Net Potential Productive Interval Map

- Thicknesses of the NPPI were plotted on maps and the values were contoured. Data were limited to the net thickness in which the percentage of “clean” aquifer matrix was analyzed to be greater than 75 percent for the logged interval.

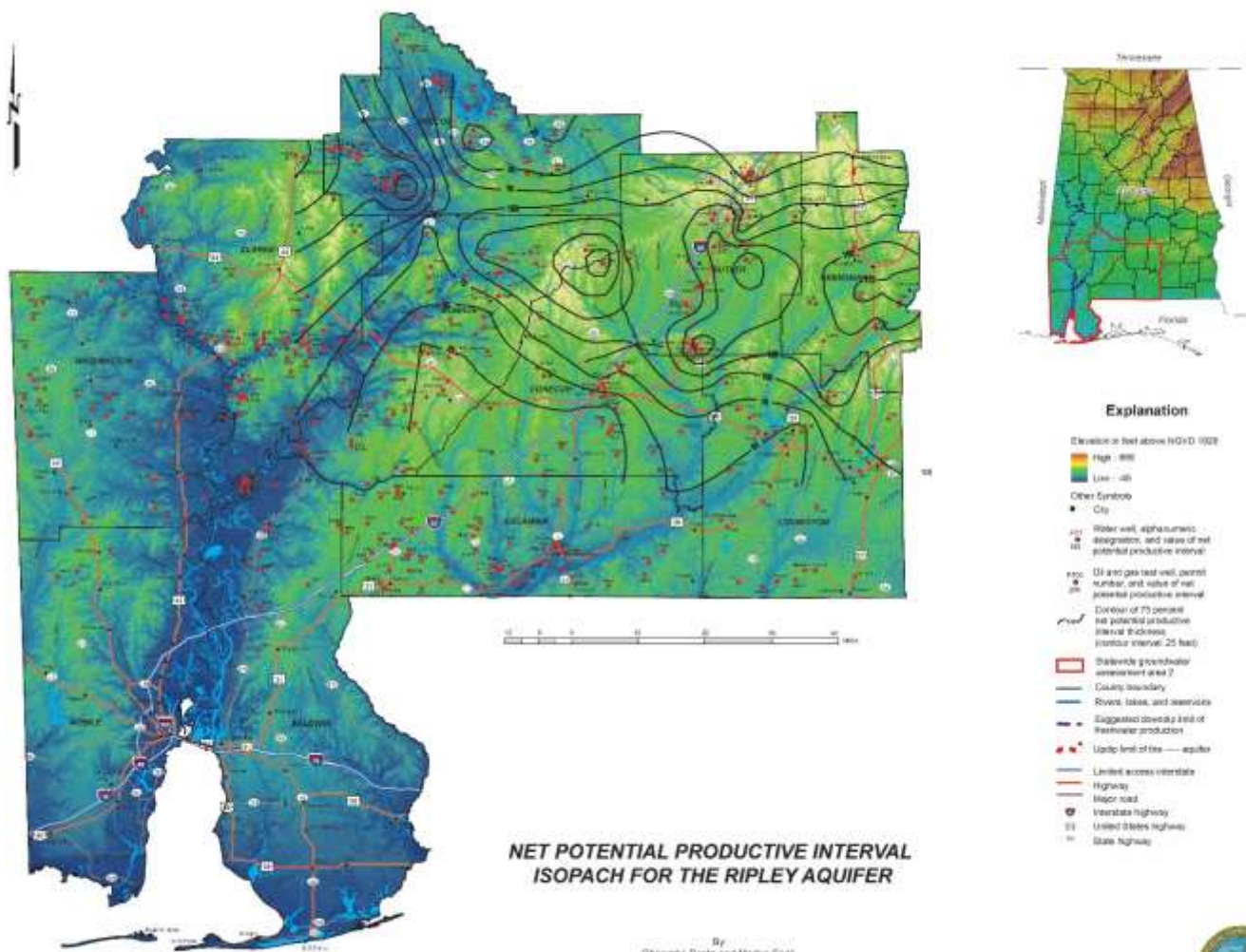




Net Potential Productive Interval Map

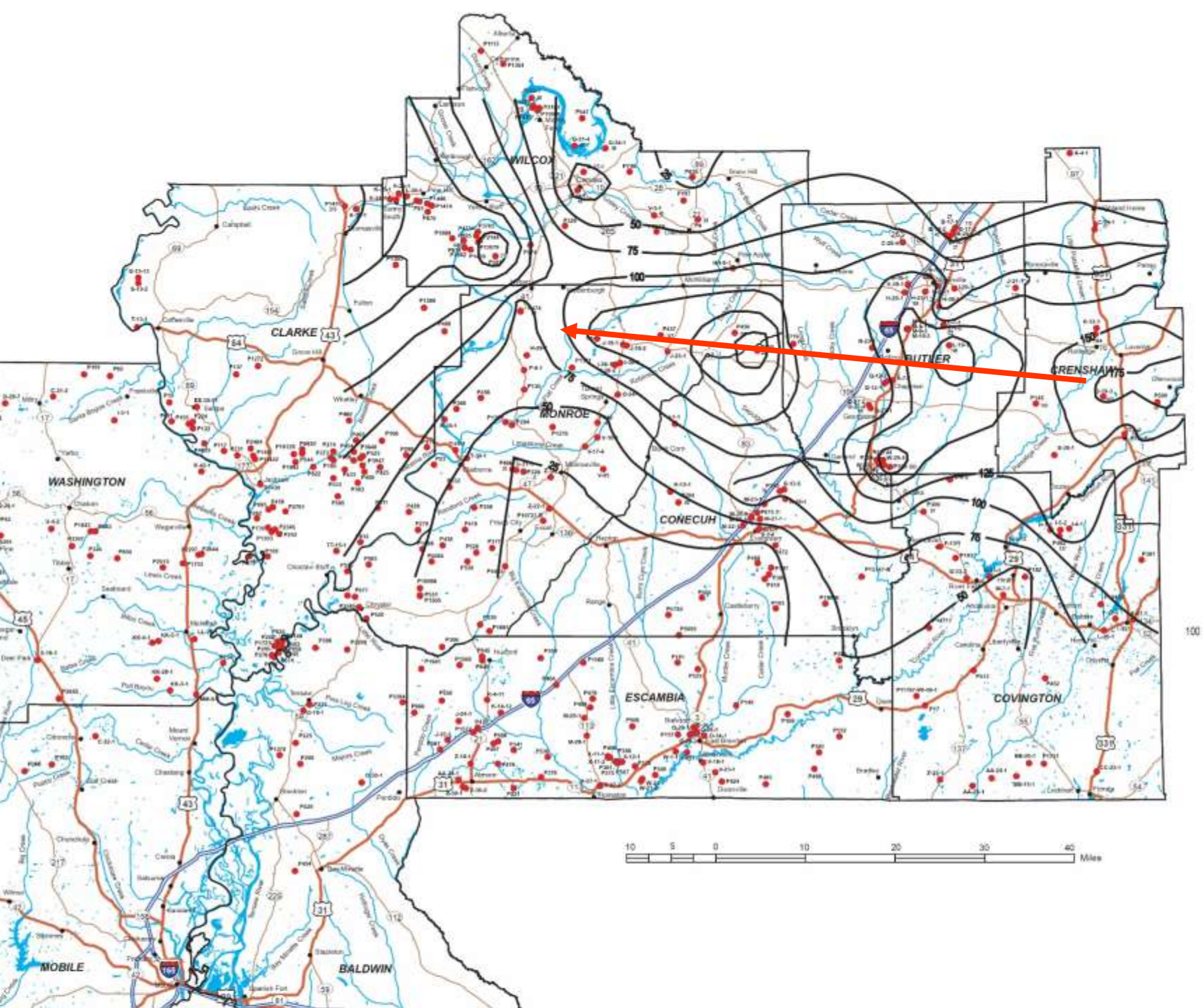
- Data generated from NPPI assessments commonly indicate limits of water production in an evaluated aquifer as a combination of net aquifer thickness and water-quality (salinity) estimation from geophysical logs.
- It should be noted that maps depicting NPPI thicknesses do not always coincide with thicknesses of the geologic formations. For example, it is not uncommon for a geologic formation to thicken southward in the study area, while the net sand/limestone content thins.





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Birmingham, Alabama





100



Conclusions



- Abundant ground-water supplies are available in much of Alabama.
- However, currently developed water sources produced from concentrated areas of withdrawal cannot sustain current production rates or additional development.
- Therefore, future water source development will require significant scientific research, substantial logistical planning and infrastructure to find adequate sources and to move water where it is needed.

