

Fracture Trace Analysis of the Eastern Panhandle, West Virginia

Kurt J. McCoy

USGS-WRD
WV District
Charleston WV



Project Objectives

- The USGS Geologic Discipline will conduct detailed lineament analysis based on satellite imagery and aerial photographs.
- USGS WRD Hydrologists will conduct aquifer testing in the field and relate surficial mapping to aquifer properties.



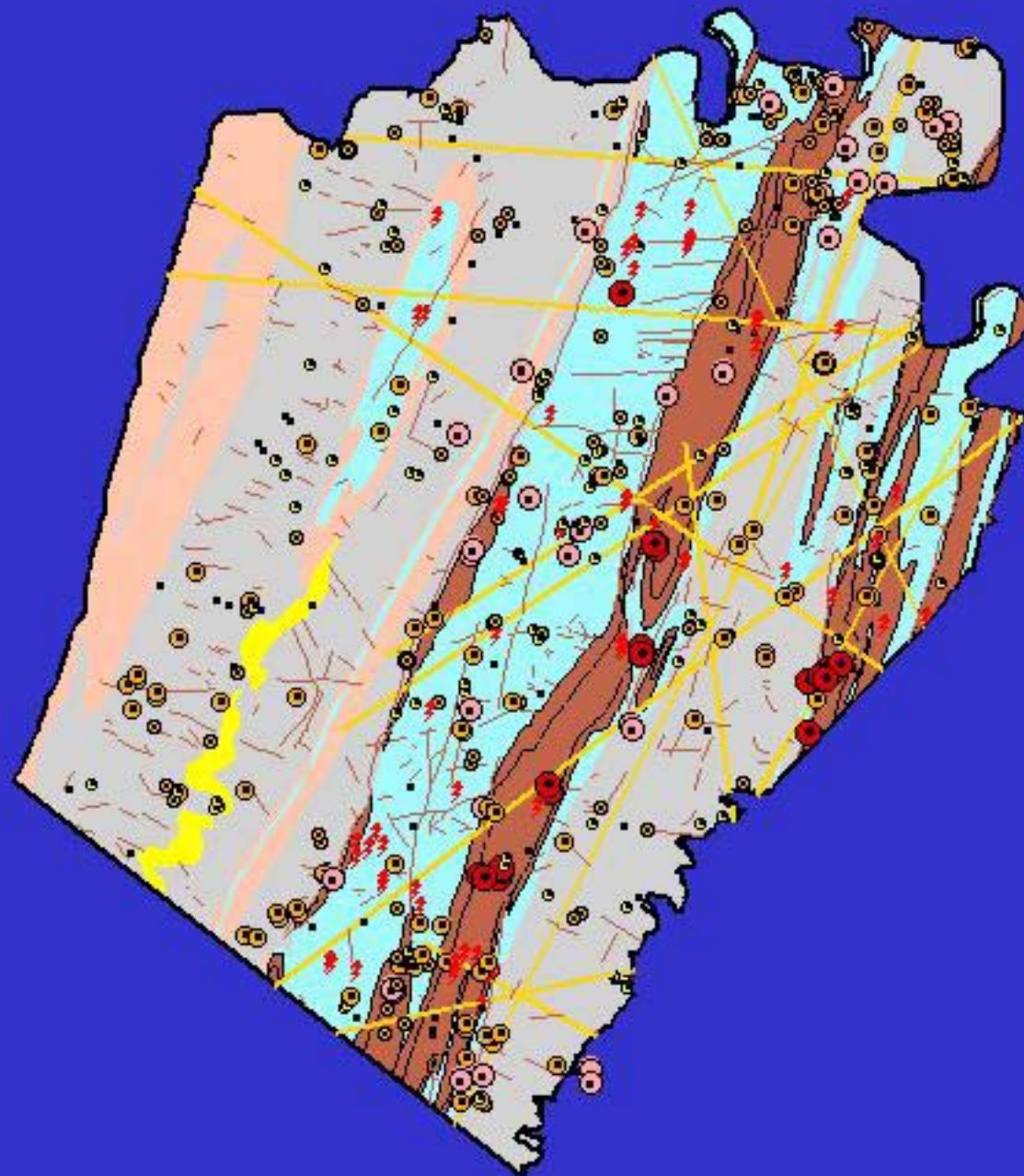
Conventional Fracture Trace Analysis

Fracture traces reflect underlying zones of fracture concentration, weathering, and thus increased permeability. (Indicators: ridge gaps, soil tonal changes, vegetation, valleys or low areas)

They are useful as a prospecting tool for locating high yielding wells.

Wells on or adjacent to a fracture trace or fracture trace intersection commonly have 10-15 times higher yields.





Berkeley County Geohydrology

Well Yield (gpm)

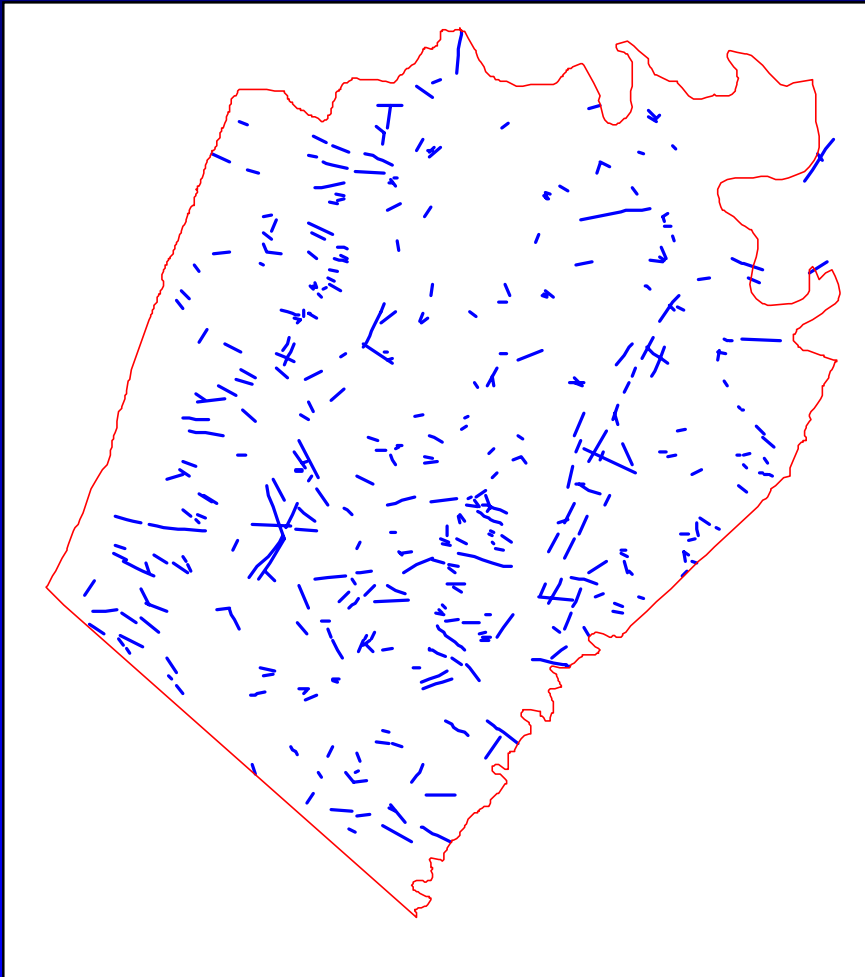
- 0-5
- ◊ 5-10
- ◊ 10-20
- ◊ 20-50
- ◊ 50-100
- 100-2000

	alluvium
	dolostone
	limestone
	sandstone
	shale
	ss/lc

-  Lineament
-  Fracture/Fault
-  Beekmantown Group

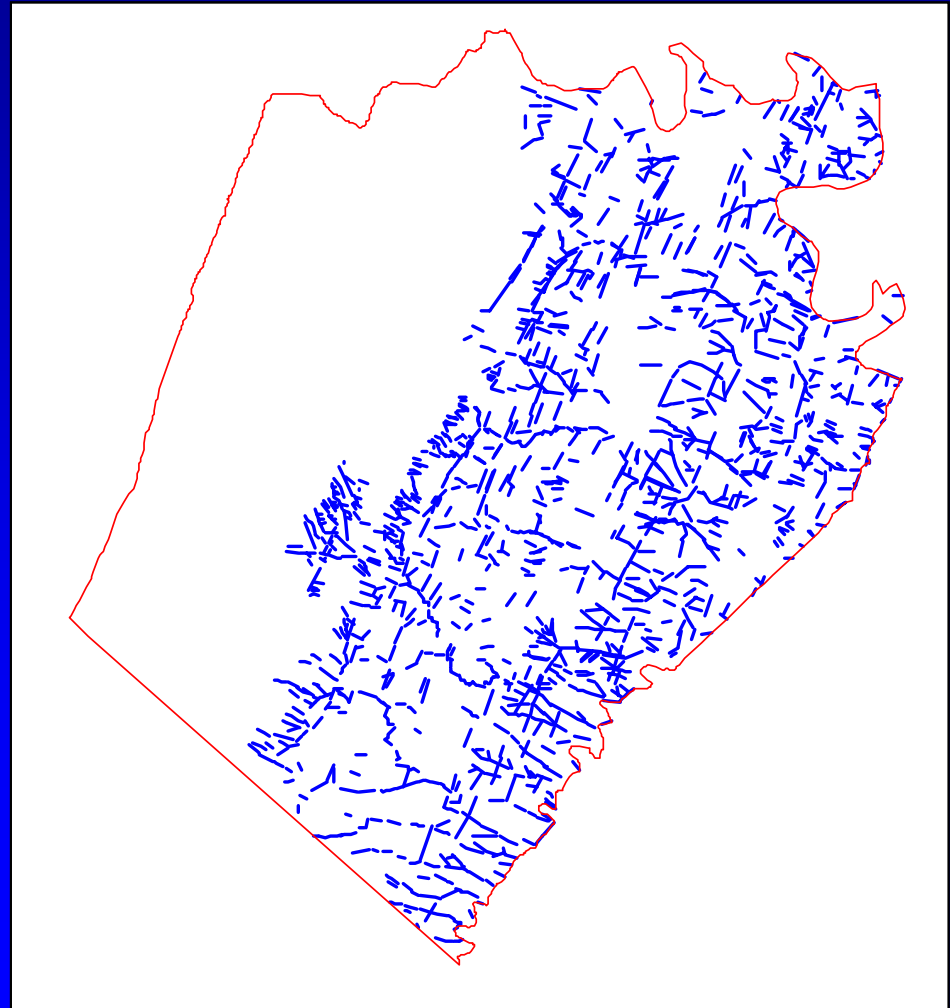
Preliminary Data

Fracture Trace Mapping



Previous mapping
From Hobba, 1976

USGS GD mapping 2003





Well Drawdown Tests

Well Locations

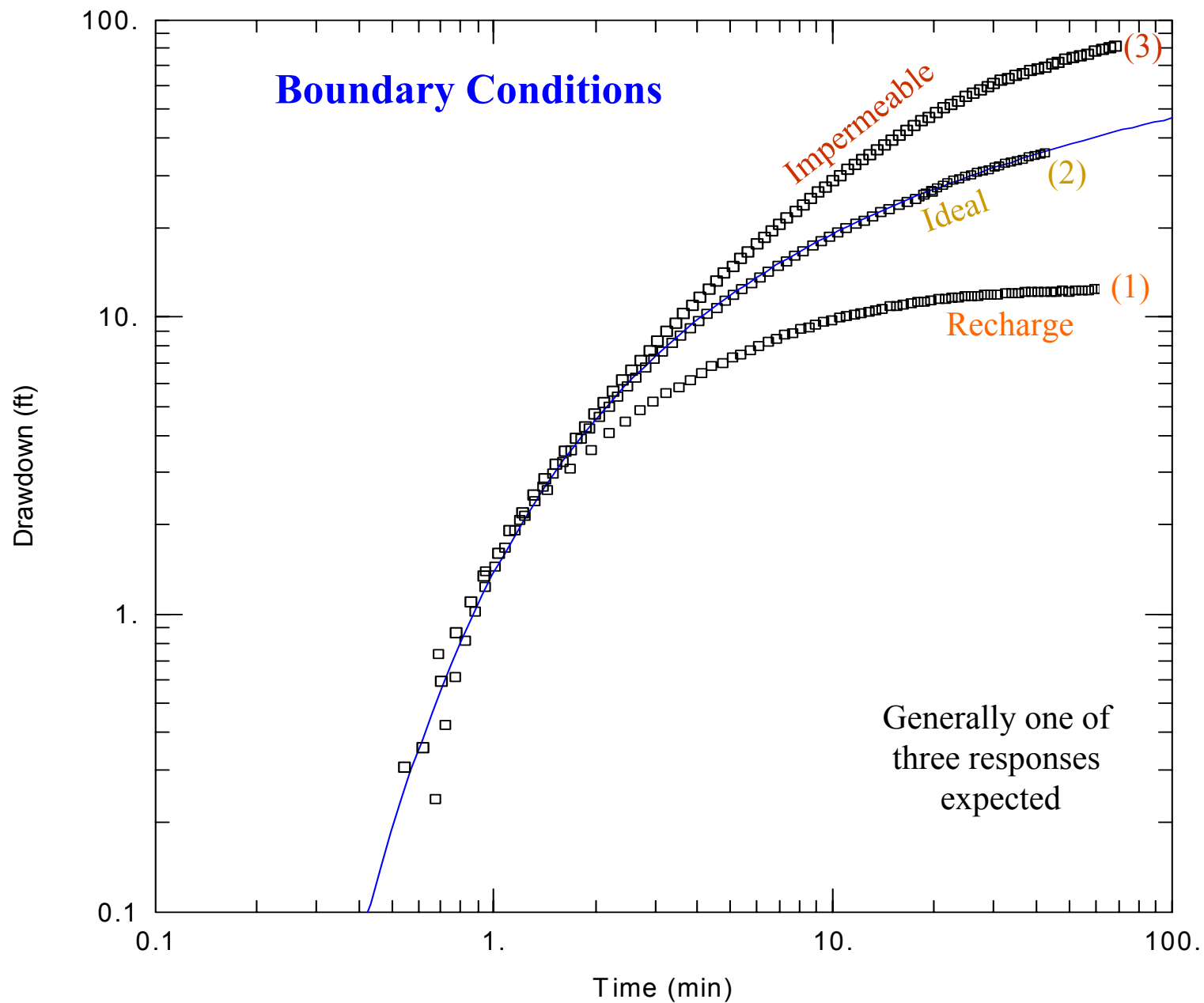
Specific Capacity
(gpm/ft)

- 0.00 - 5.00
- 5.01 - 50.00
- 50.01 - 100.00
- >100

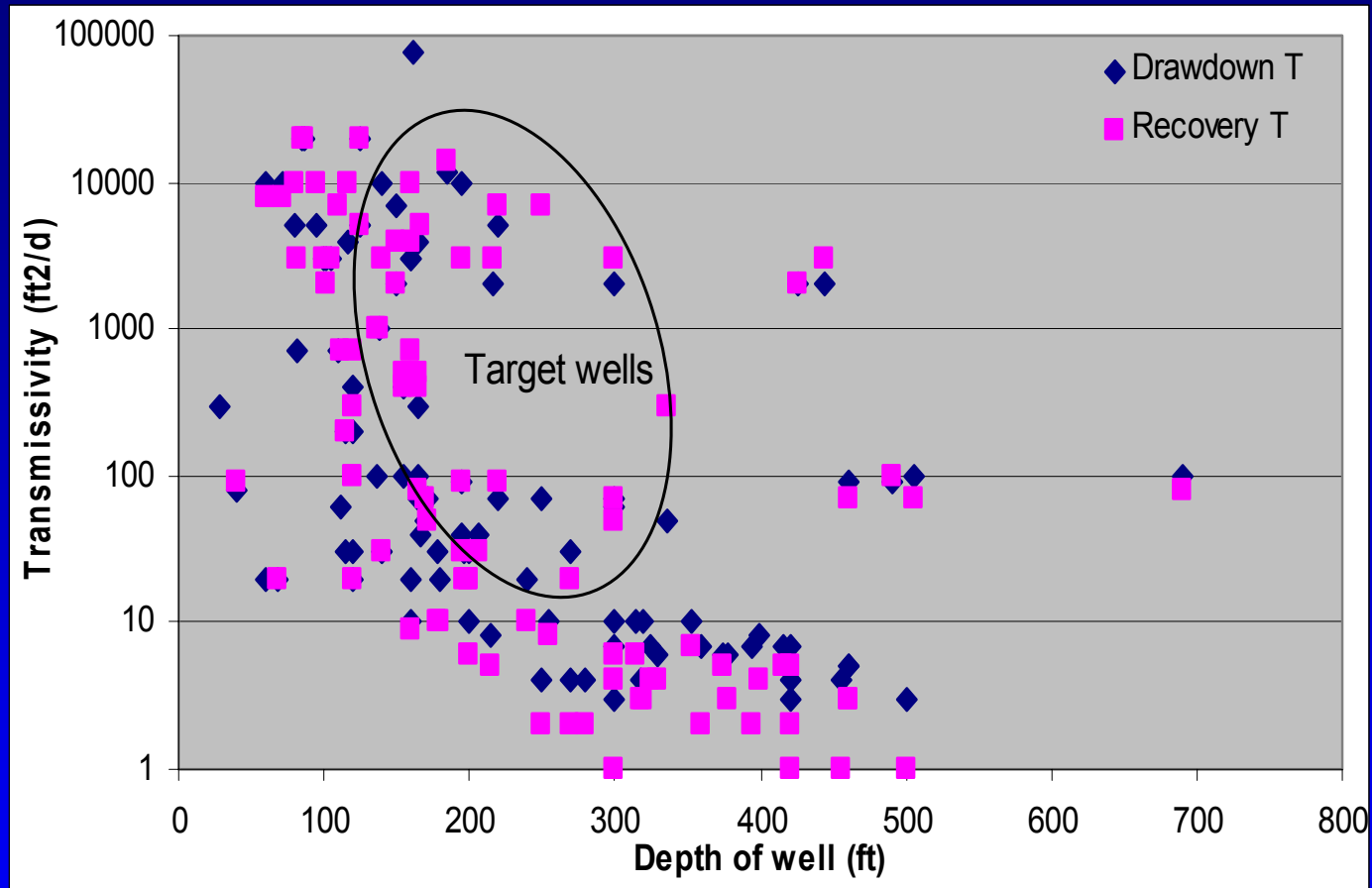
Transmissivity: A measure of the aquifer ability to horizontally transmit water.

Ex. $T > 1000$ Public Supply Well

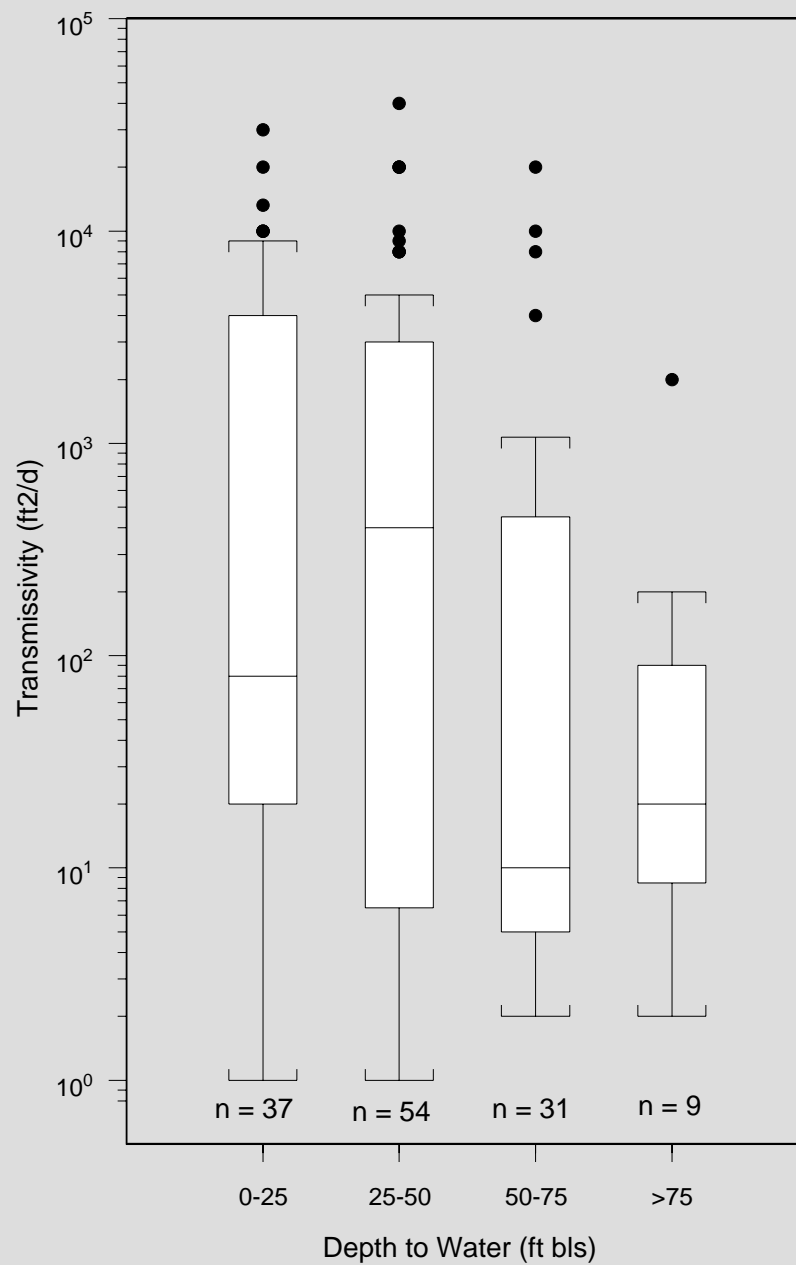
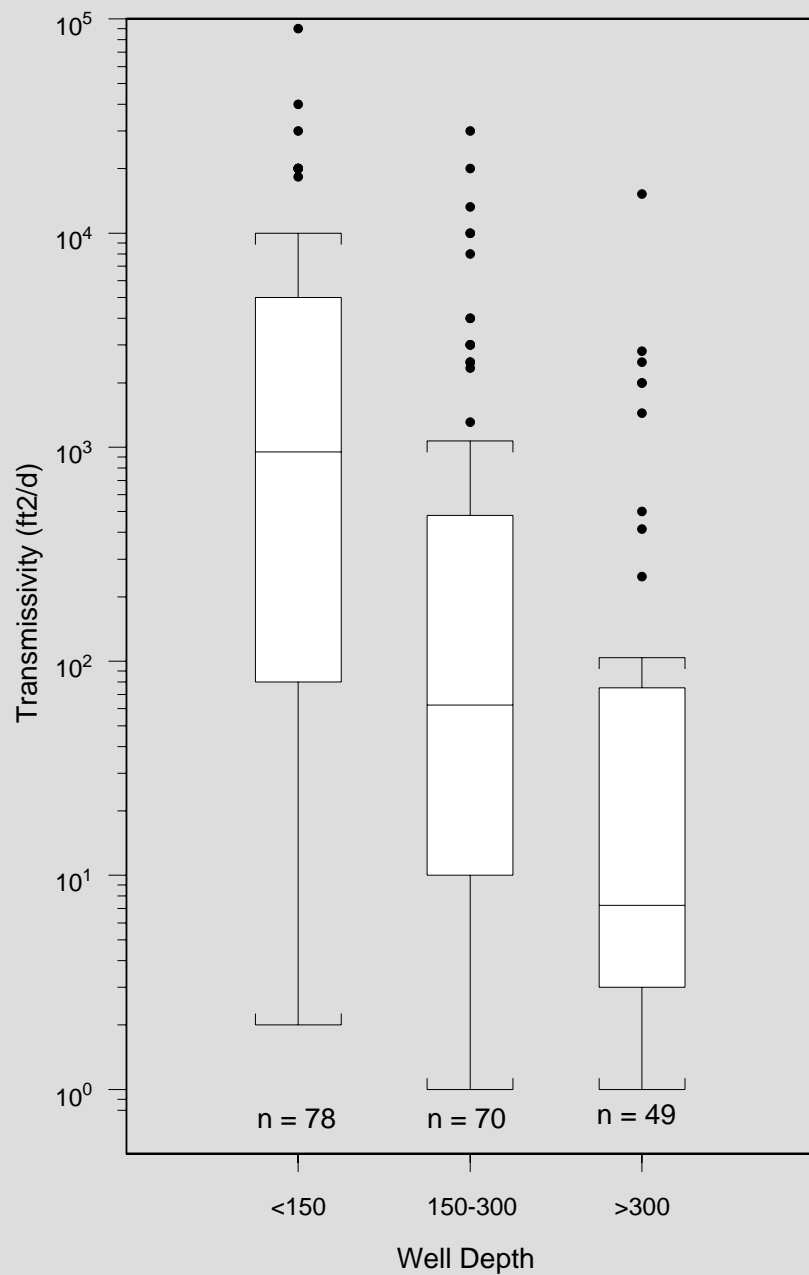
$T < 10$ Domestic Well

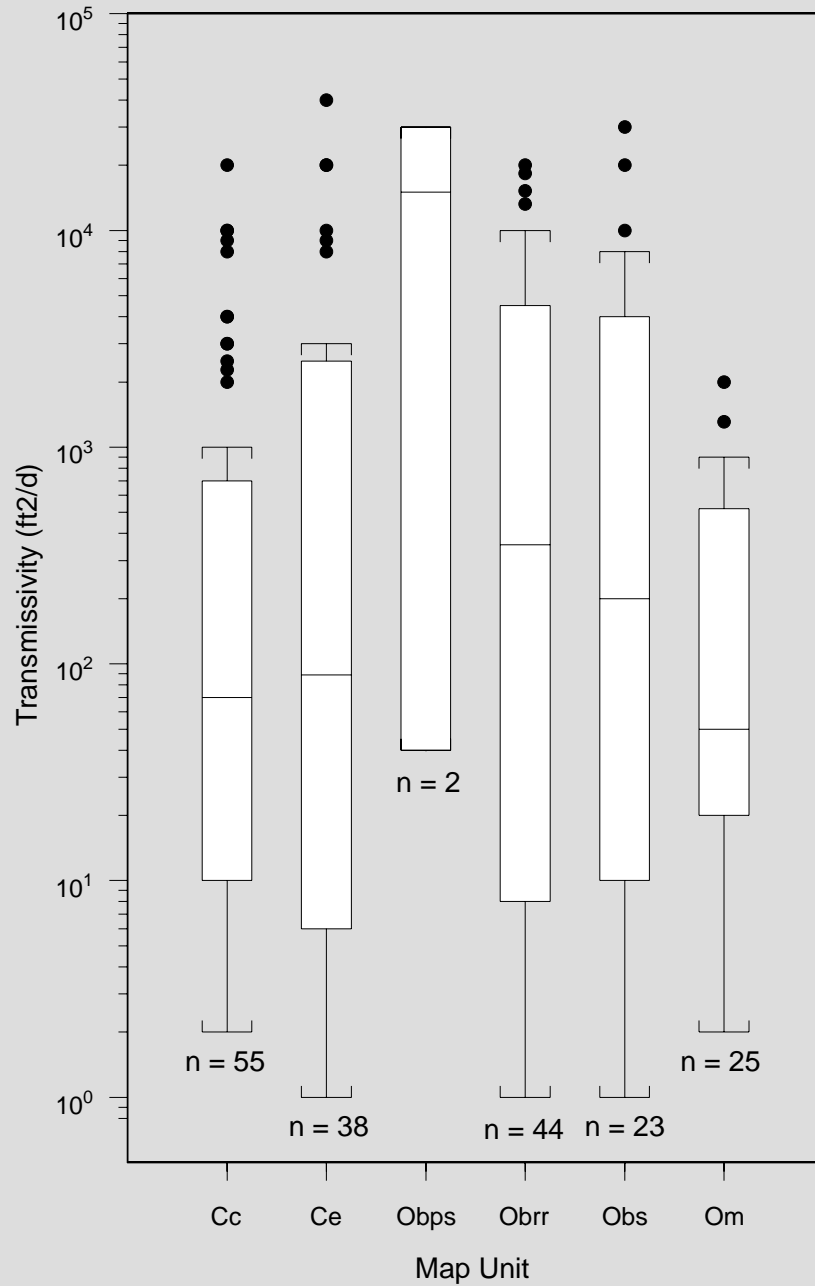
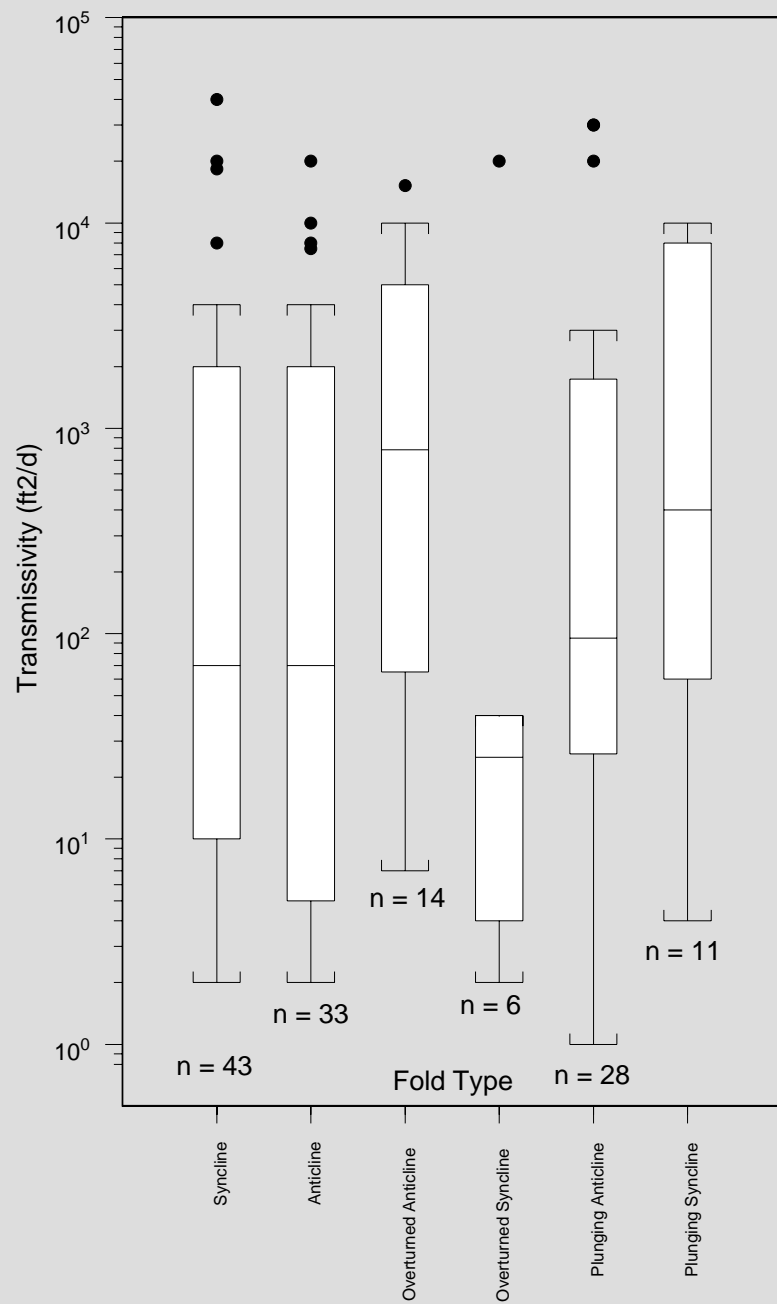


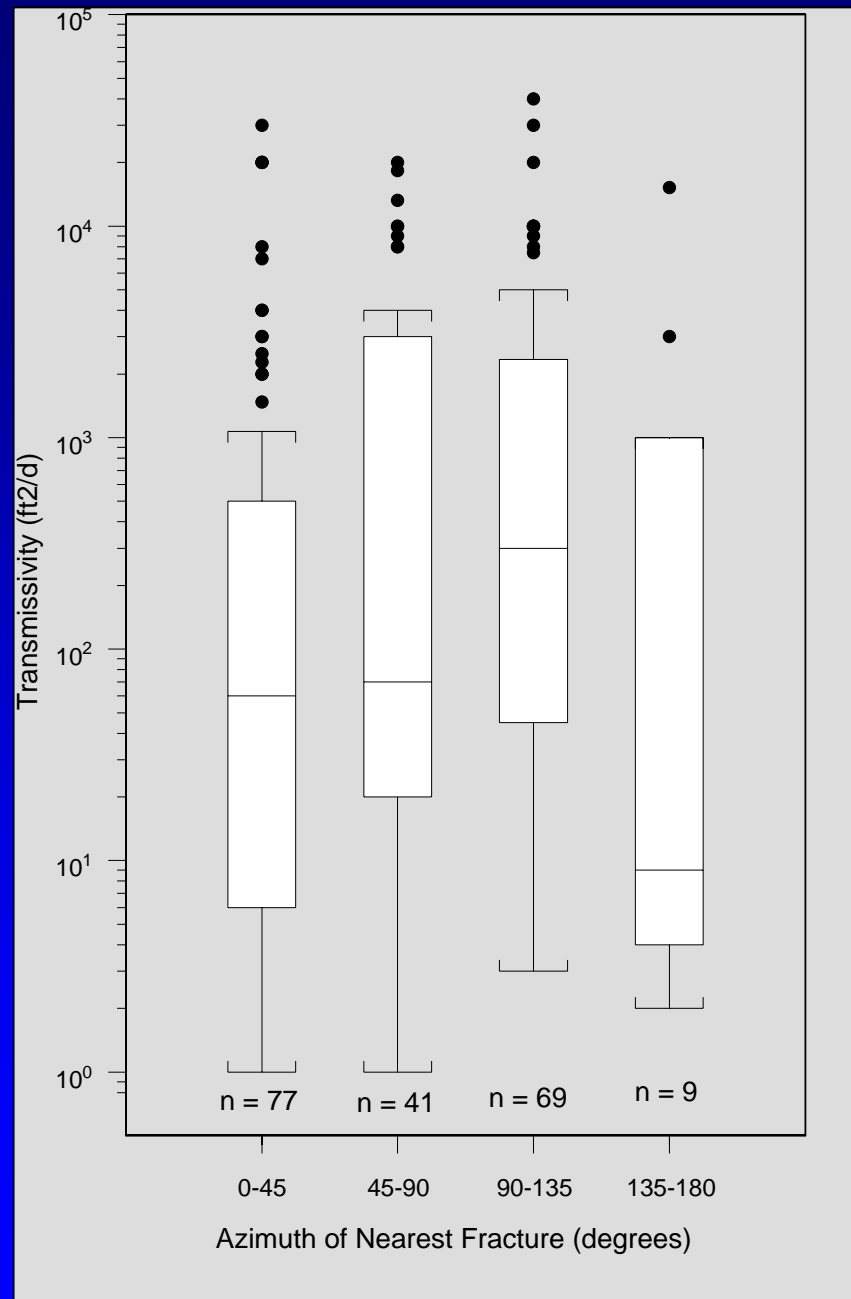
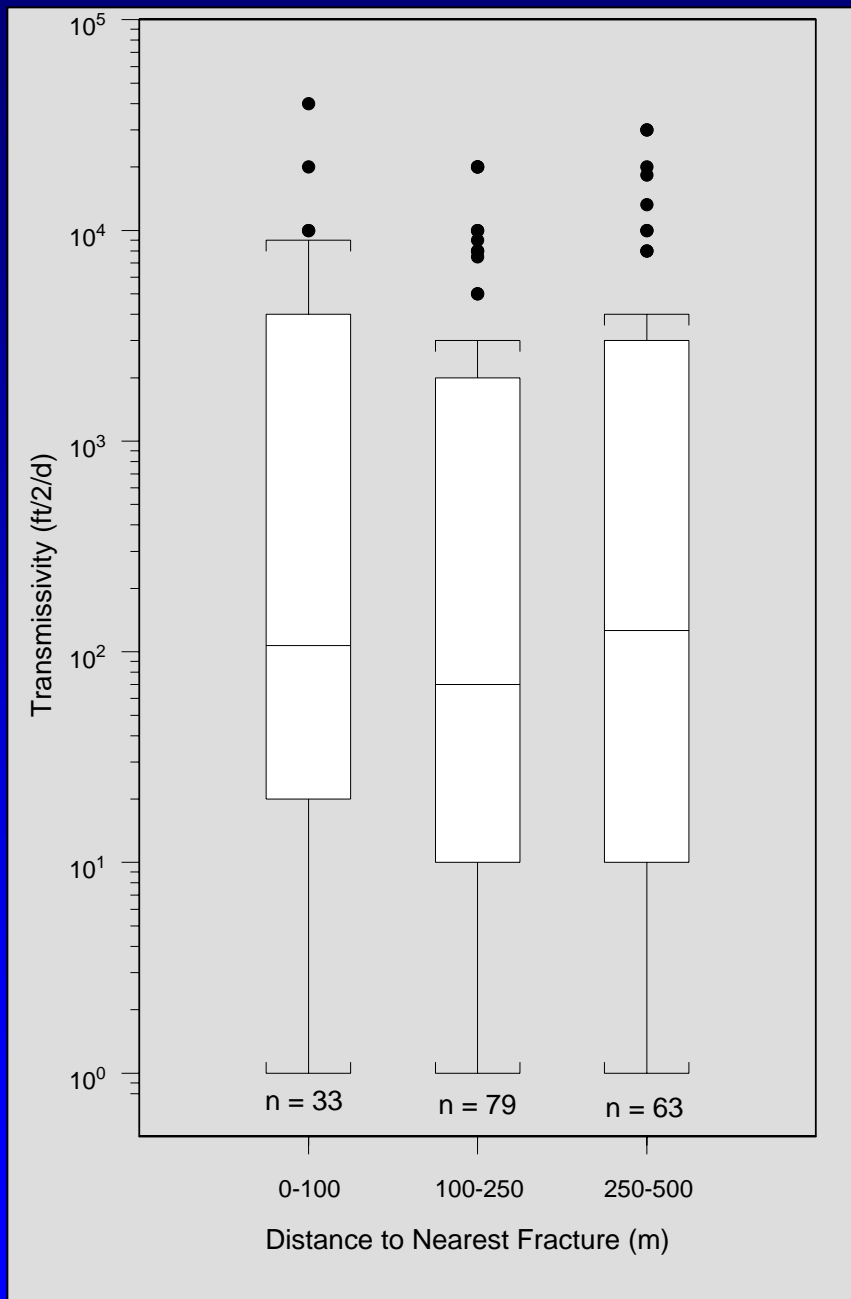
Well Drawdown Tests

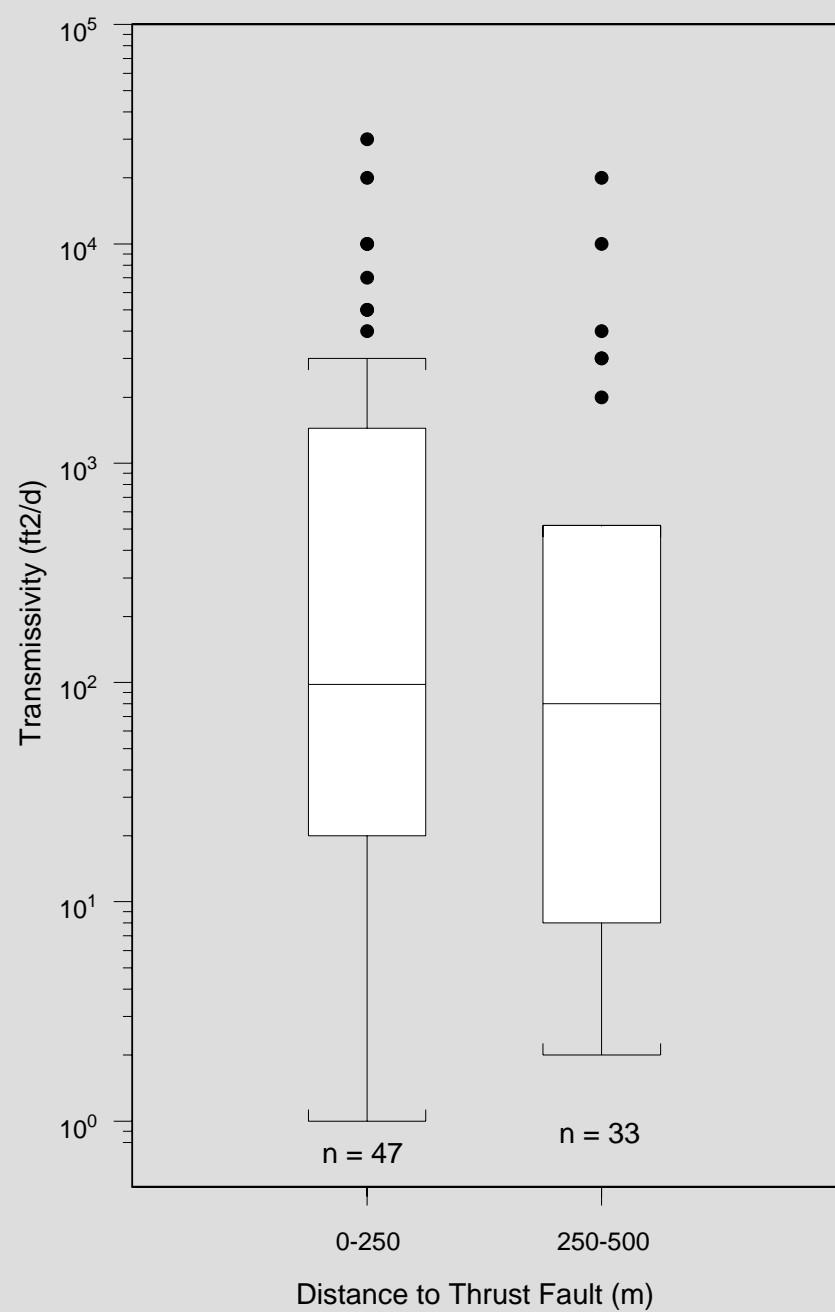
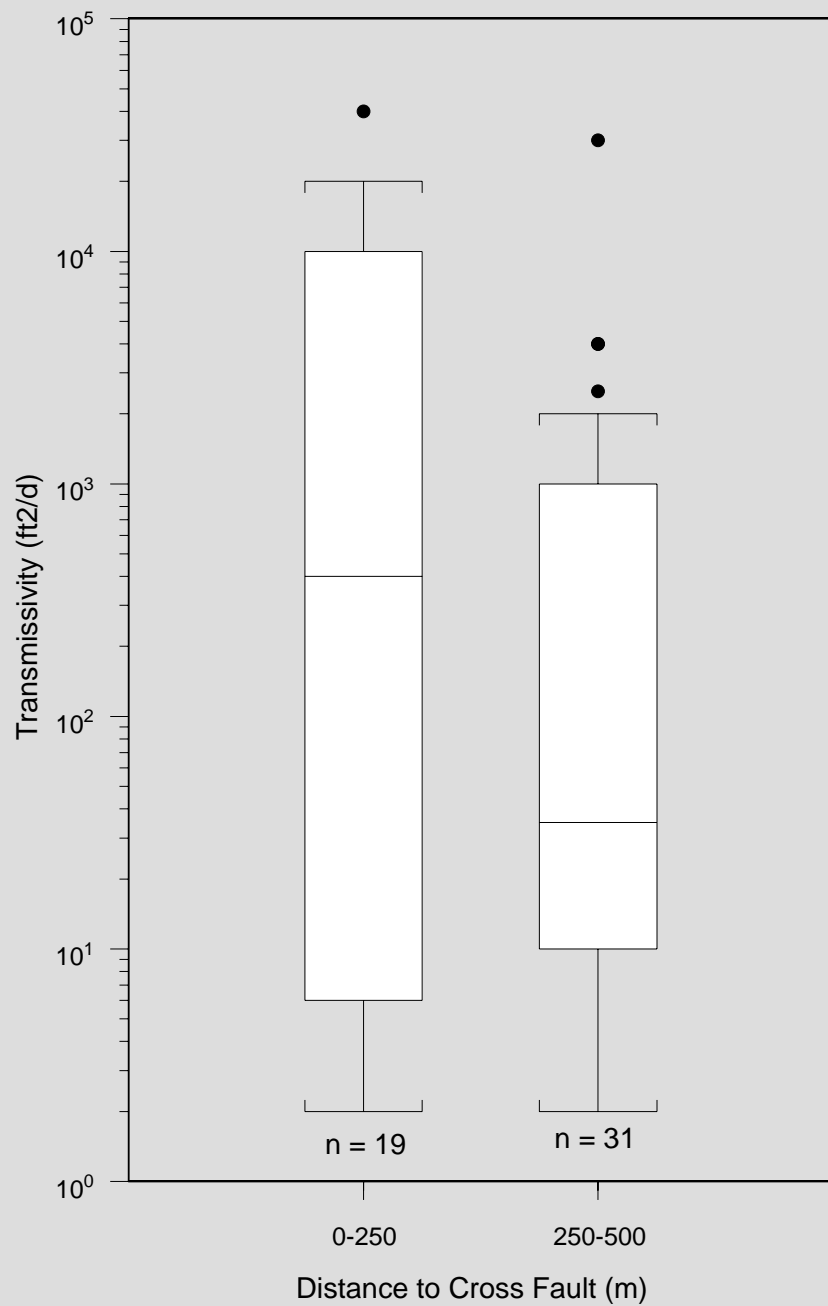


Deeper wells generally are located in less transmissive areas indicating fractures are either less dense, have smaller apertures, or receive little recharge. Depth of zones supplying majority of water to wells is unknown. Generally high production wells are not excessively deep.









Bottom Line

Drill Now

Cross faults
Complex folds
Cross strike fractures
Beekmantown Group

Drill Later

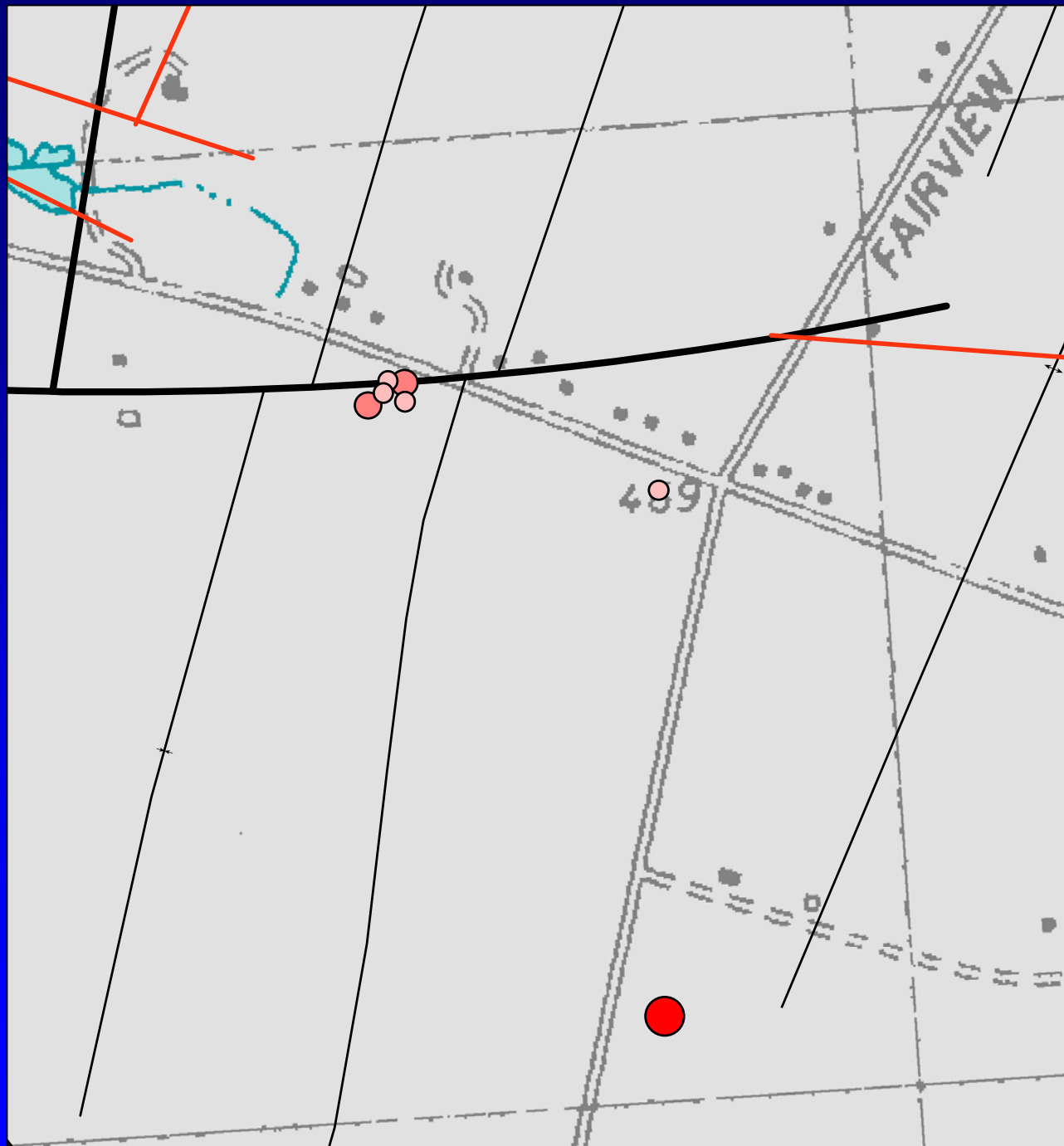
Depth
Distance from relationships
Thrust faults
Topographic Position





Cross Fault

Route 45 near Berkeley/ Jefferson County line

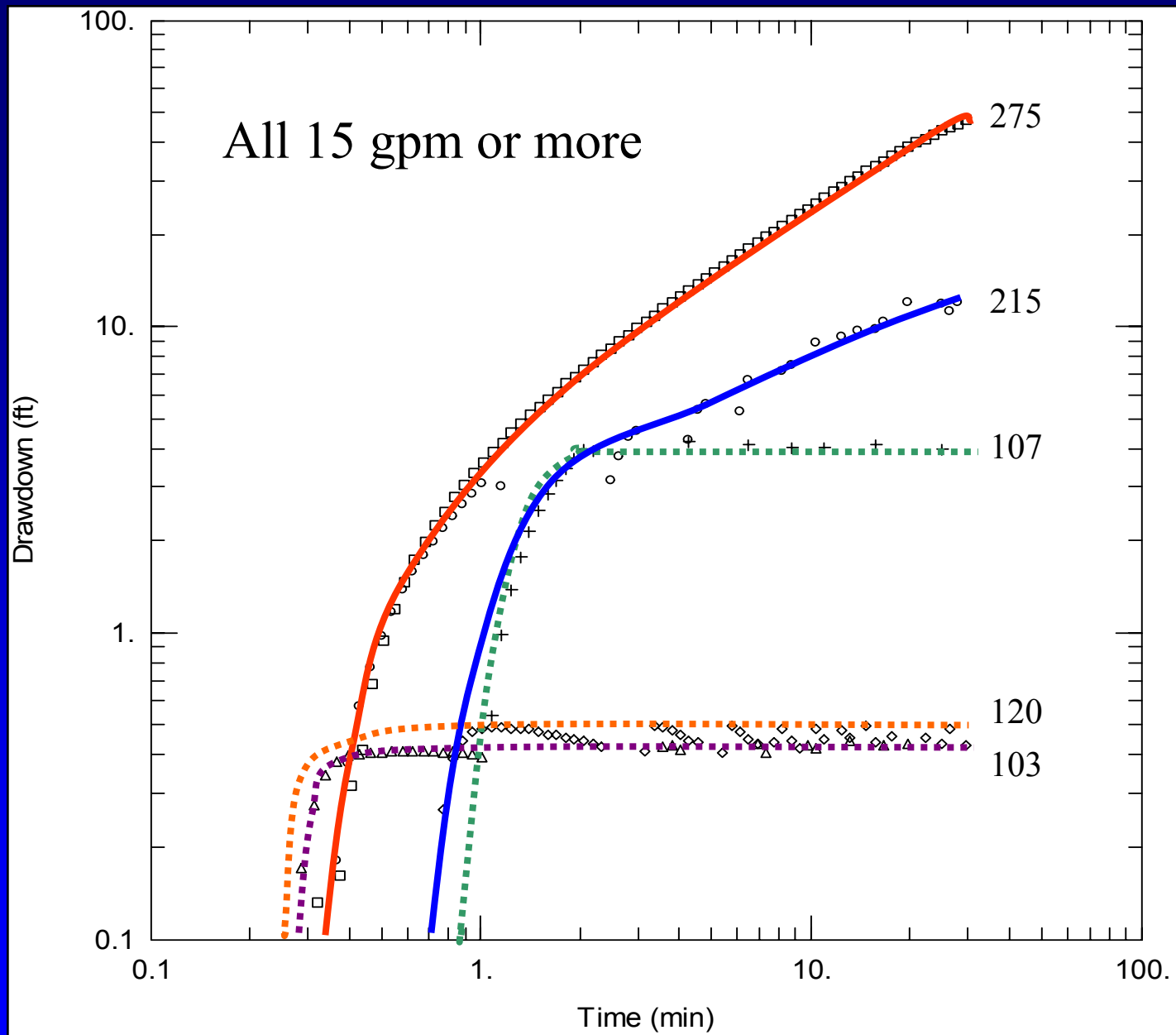


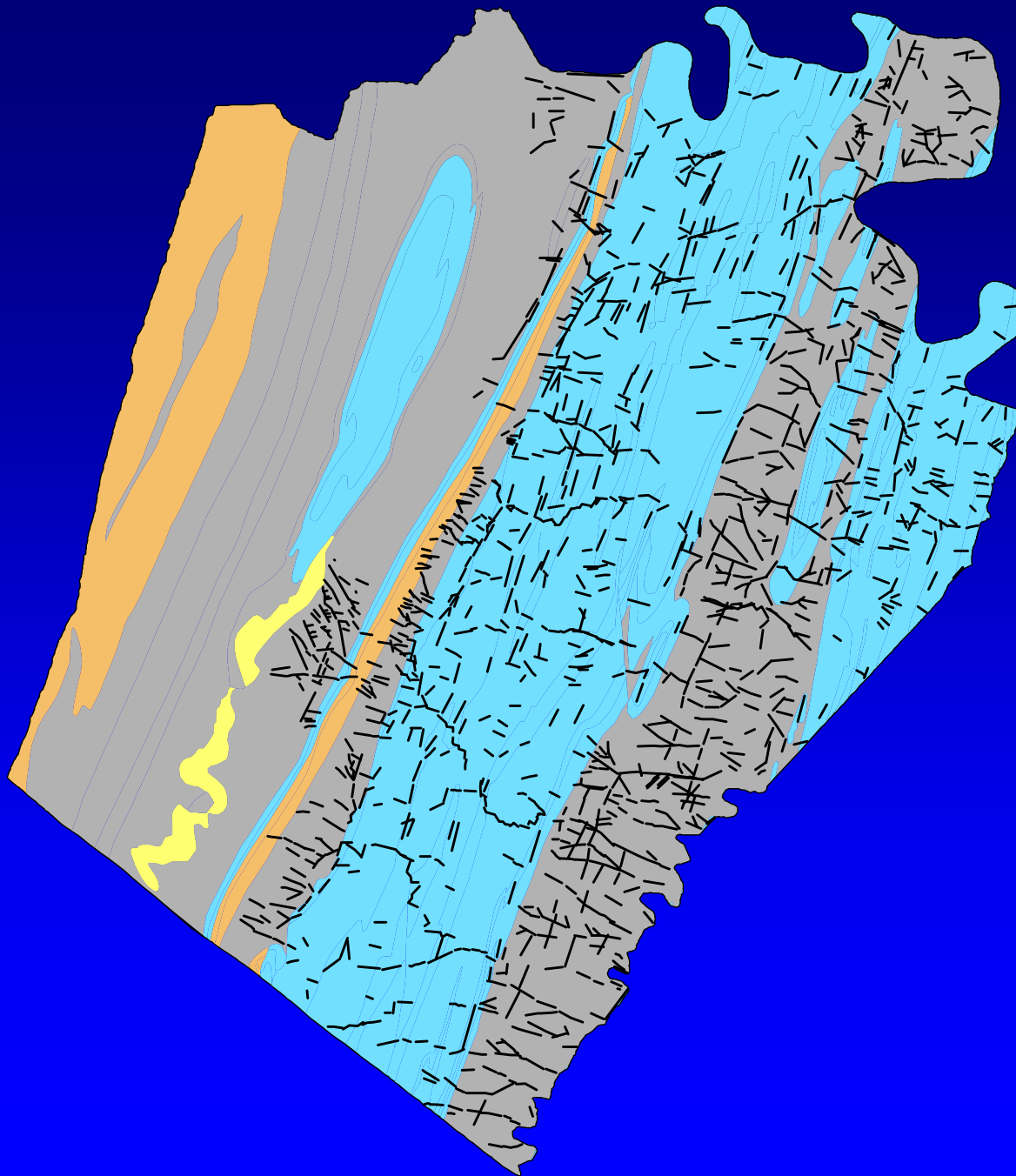
Well Locations

Specific Capacity
(gpm/ft)

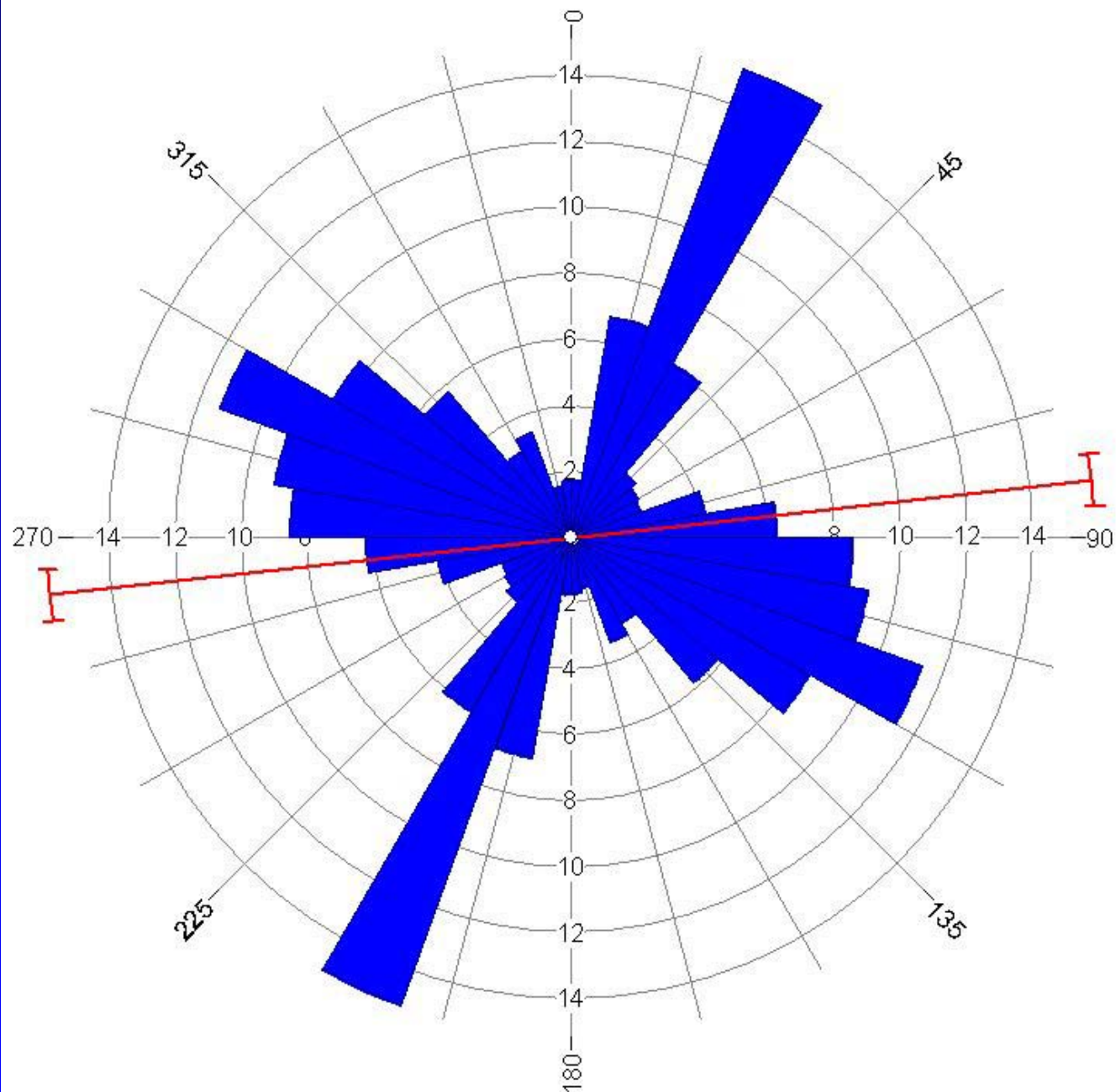
- 0.00 - 5.00
- 5.01 - 50.00
- 50.01 - 100.00
- >100

- +— Anticline
- o— Overtumed Anticline
- +— Plunging Anticline
- +— Syncline
- Fault





USGS GD
Fracture
Mapping 2003



Rose diagram
Based on
Length







Conclusions

- While some features appear conducive to exploratory drilling, high yielding wells can be found in almost any setting.
- Simple fracture trace analysis, while effective, is not enough to fully characterize controls on flow.
- Features/flowpaths may not have a surface expression.
- Data in addition to surficial mapping is necessary. (i.e. surface geophysics, numerical modelling)