

Got Lemons? Make Lemonade!*

Gary Perry¹

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¹GeoTrace, Richardson, TX (dlafoy@geotrace.com)

Abstract

During rough times in the oil patch, geophysical or “seismic” budgets are usually pretty close to the top of the list for cutting back or even eliminating. However, some forward-looking companies actually do the opposite – they increase spending on geophysical analysis. There are many reasons this is a good idea; acquisition and processing costs are considerably lower, personnel on both the oil company and contractor side have more time to devote to these projects and, when done properly, they will have served to high-grade drilling prospects to exploit when the industry has recovered. This paper will present cost estimates and benefits and will outline some recent developments in reservoir analysis.

Got Lemons?

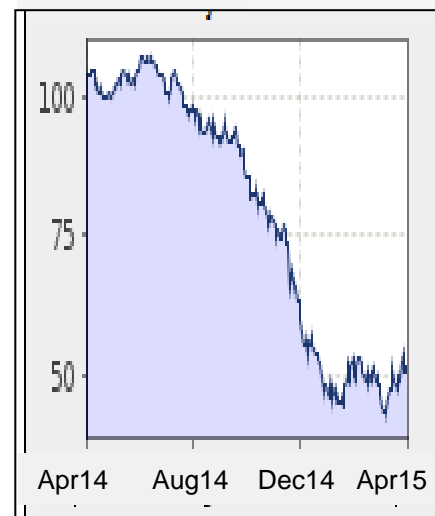
Make Lemonade!

Gary Perry
Geotrace Technologies



10-year look at WTI

CLF05 - Crude Oil WTI (NYMEX)

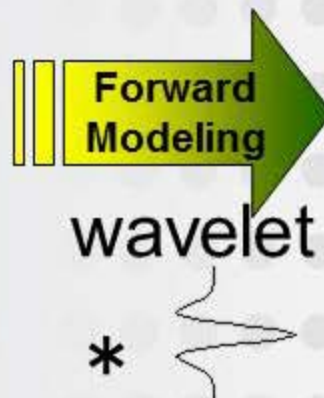
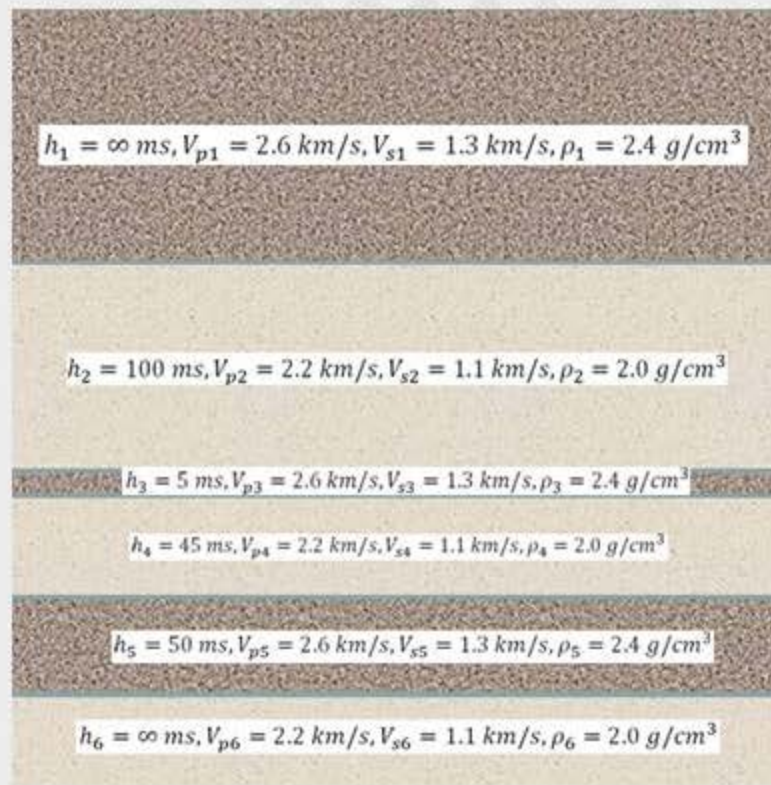


An Eagle Ford hypothetical example

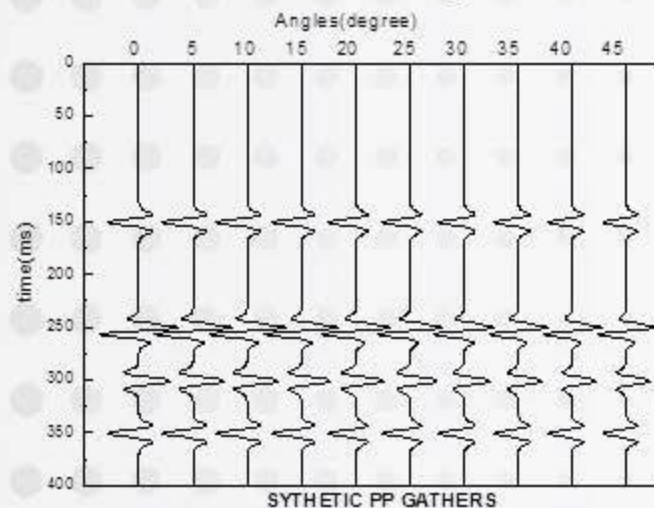


Model Based Inversion

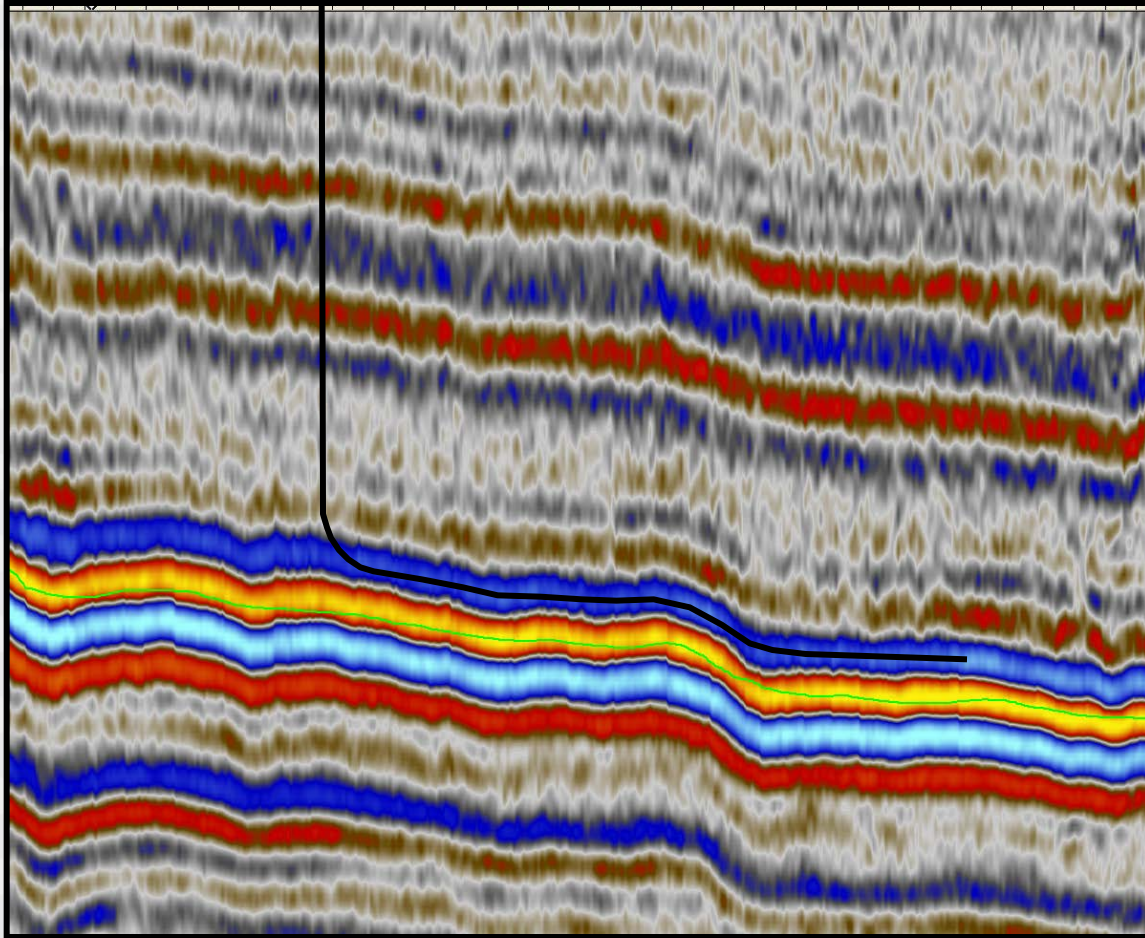
Geological model with rock properties



AVO Model Responses

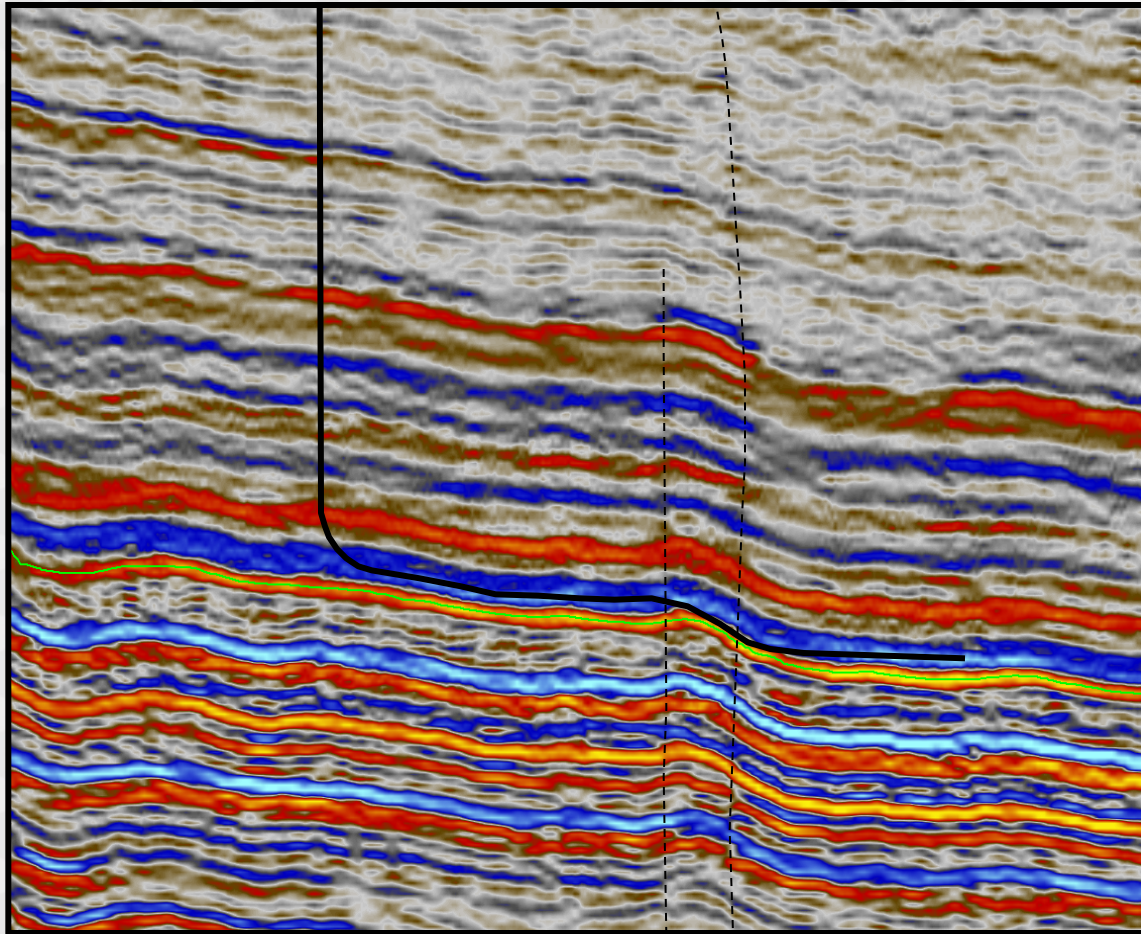


Minimize difference between AVO model and seismic, guiding the result with geological constraints.



Conventional seismic

Faults are often encountered that could not be seen on conventional data (but CAN be seen on broadband data)



Broadband data

For this exercise remember...

In most resource plays

Fracking costs as much **or more** than drilling.

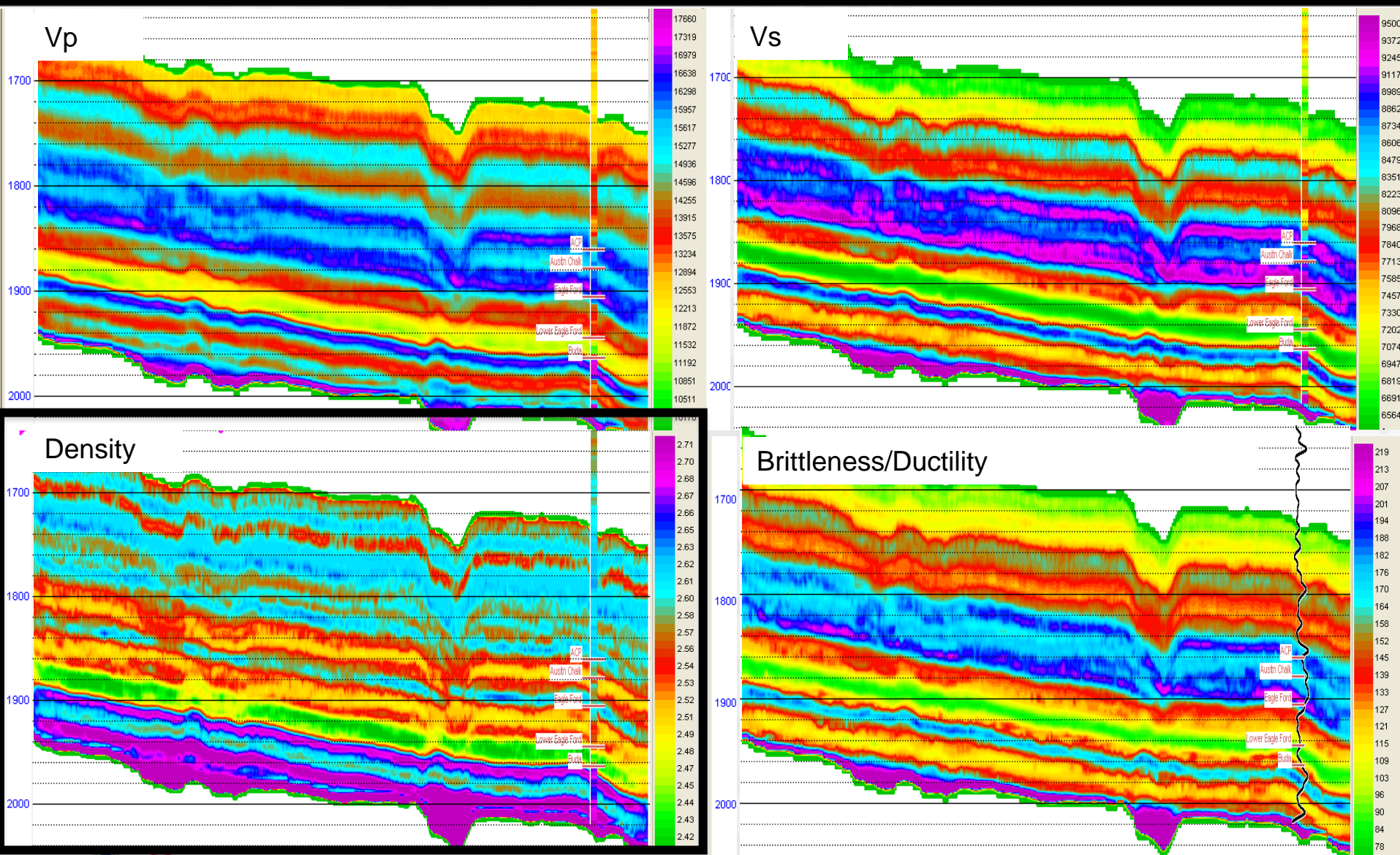
In the Eagle Ford play, drilling costs about \$4mm.

Fracking and completion may cost up to \$5mm.

In the Barnett play it is estimated that 70% of wells have under-performed and

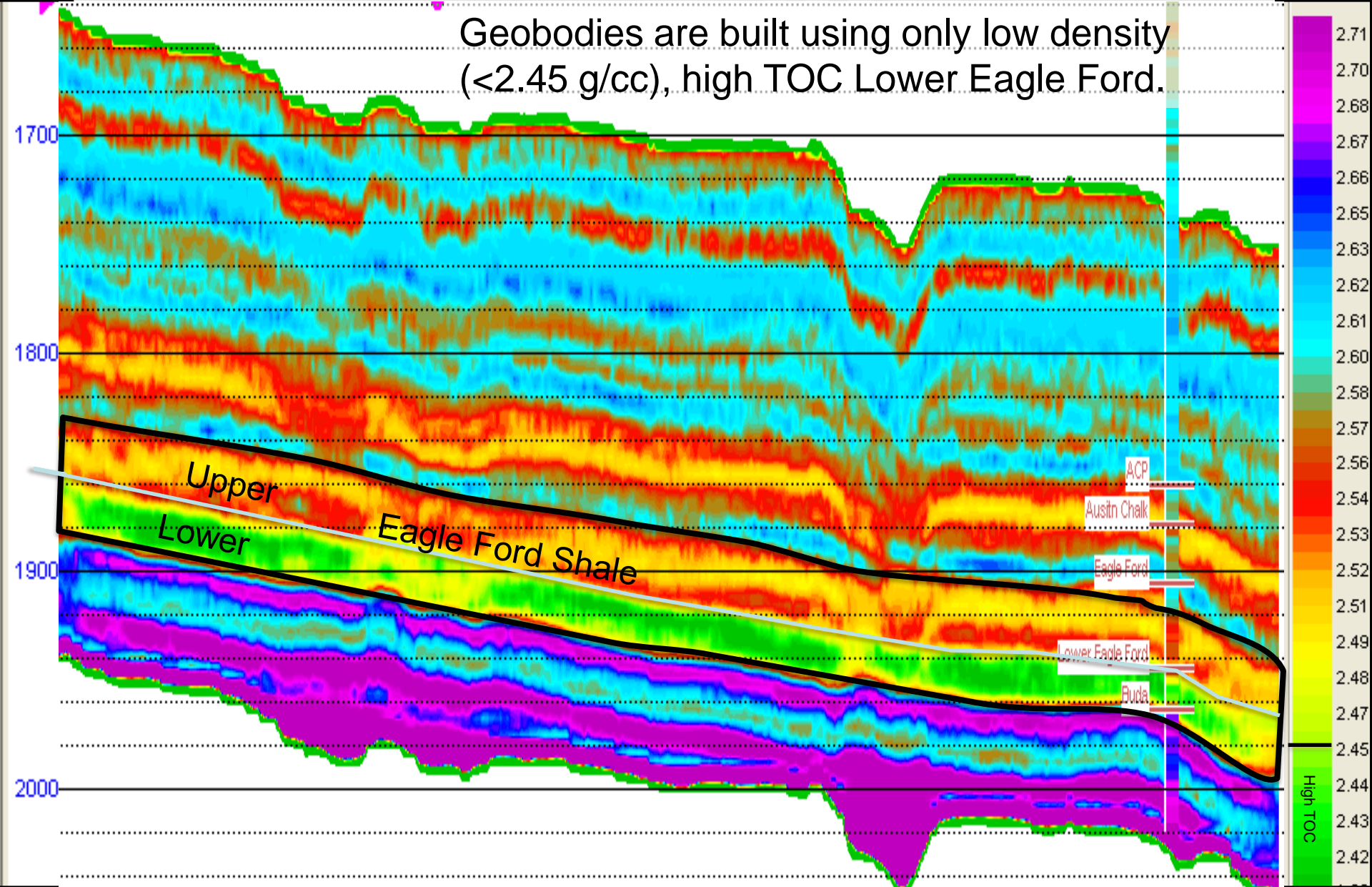
Up to 50% of frac stages (in ALL plays) have yielded no significant hydrocarbons.

Pre-stack Inversion results with well correlation overlays



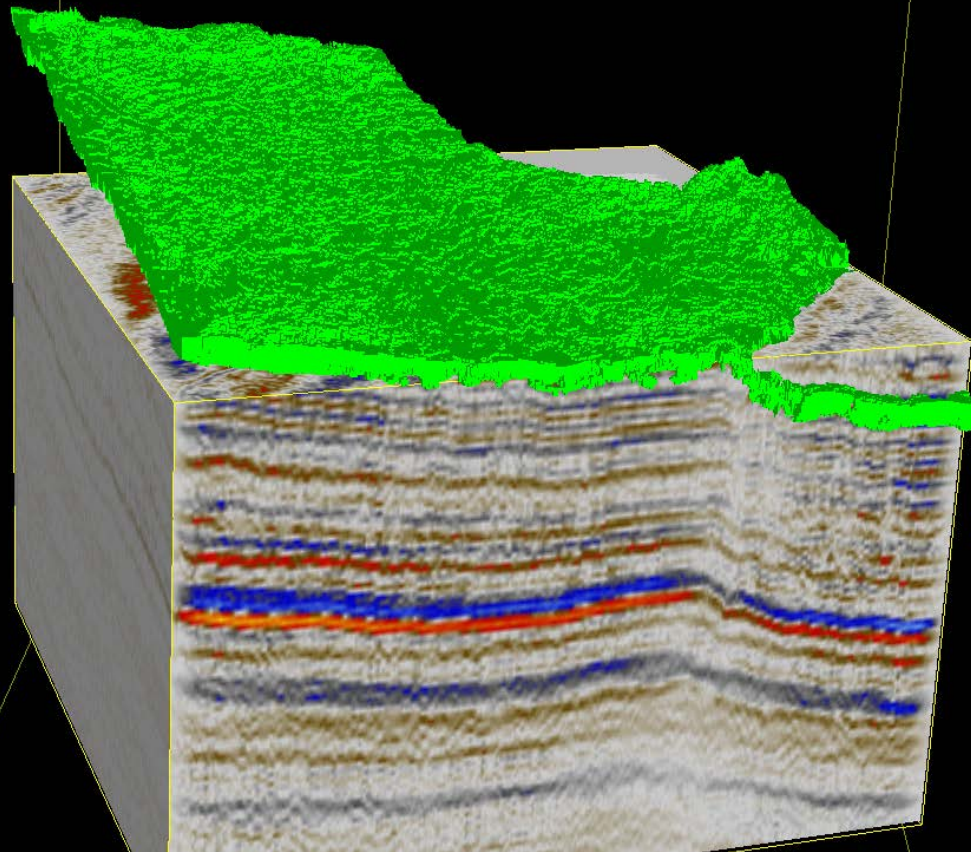
Pre-stack Inversion (density)

Geobodies are built using only low density (<2.45 g/cc), high TOC Lower Eagle Ford.

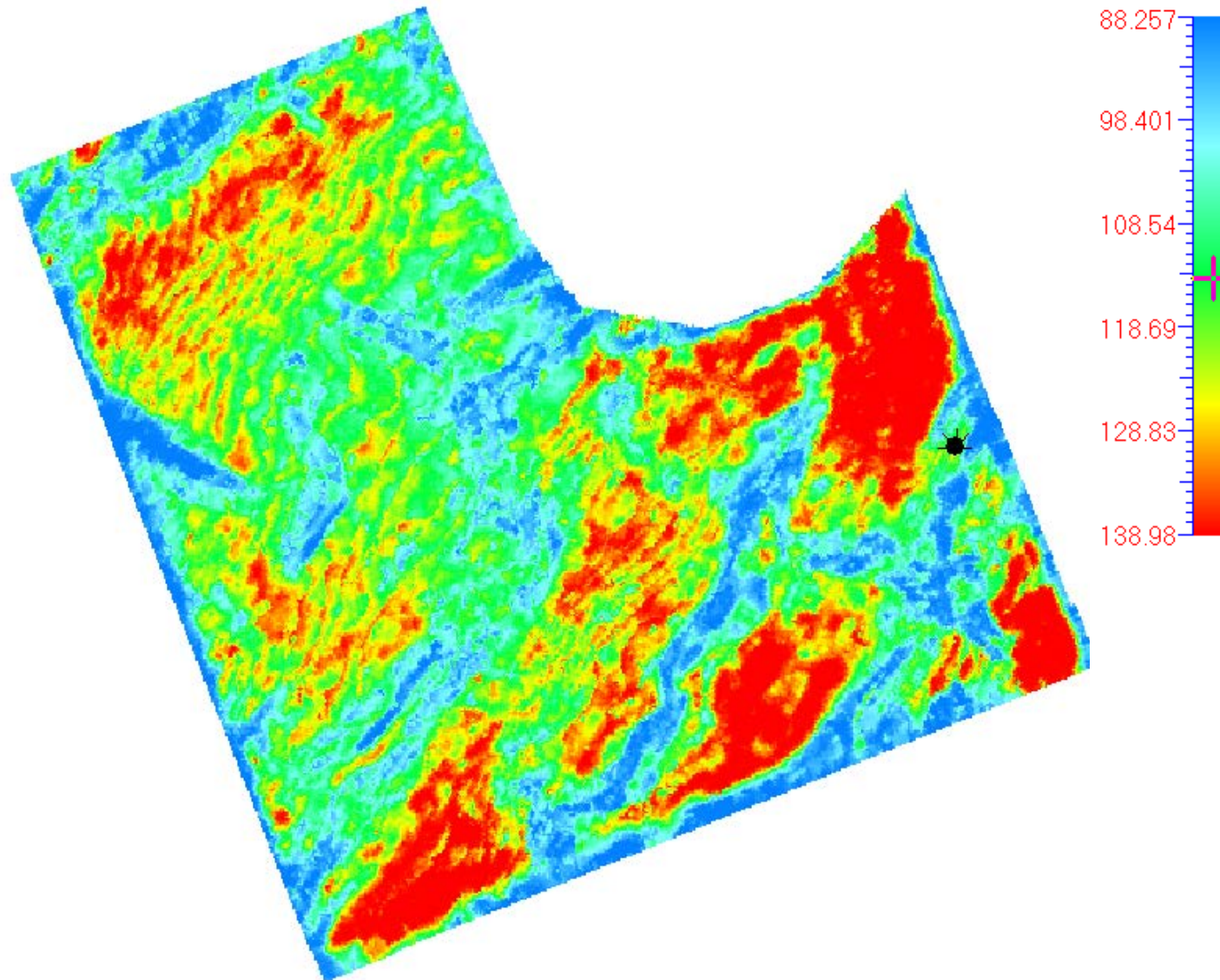


Lower Eagle Ford Geobody

Properties are then averaged over the interval to determine thickness, TOC and brittleness as well as likely fault and fracture locations.



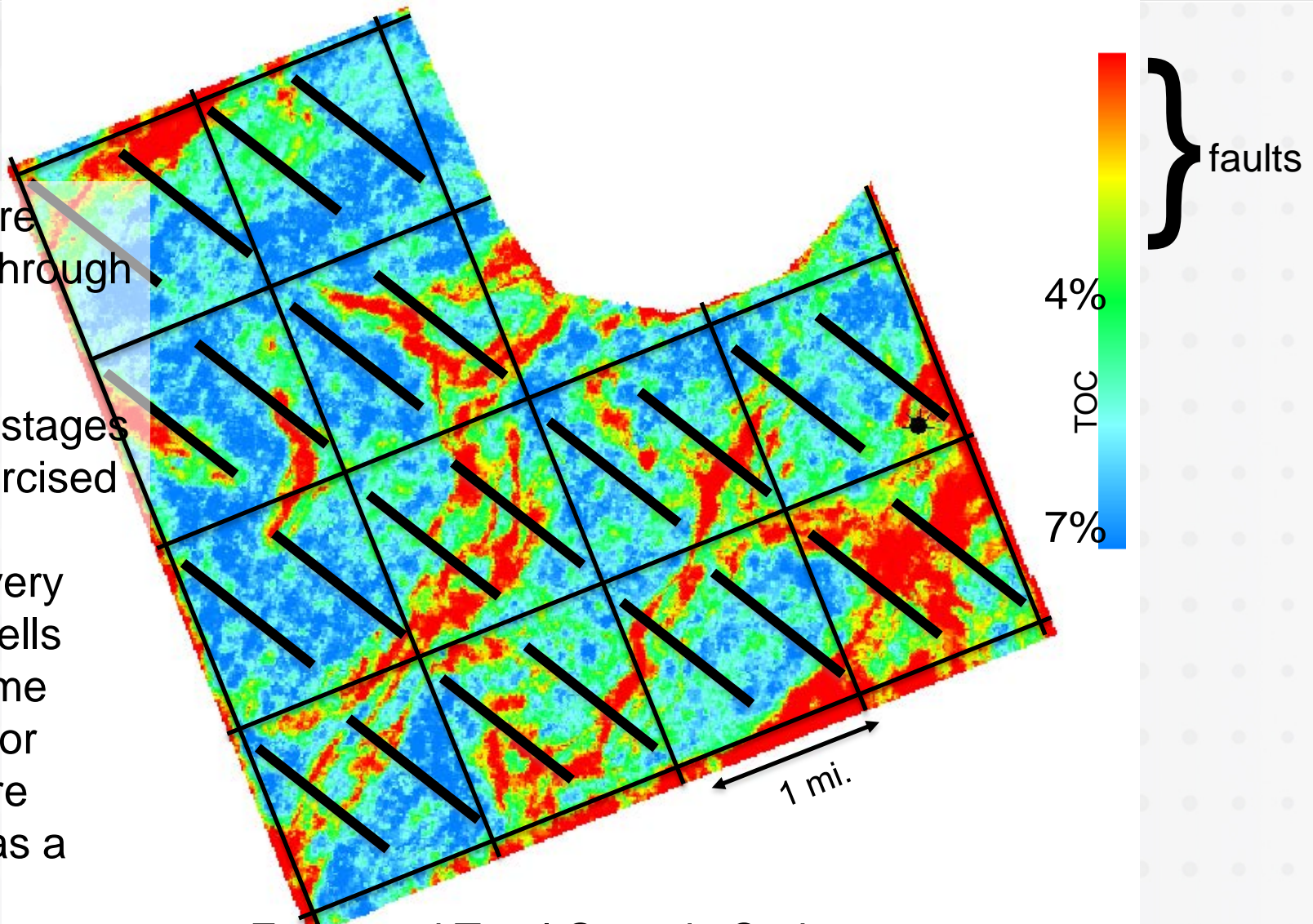
Brittleness of Lower Eagle Ford Shale (Young's Modulus/Poisson's ratio)





Hypothetical results using conventionally drilled resource play

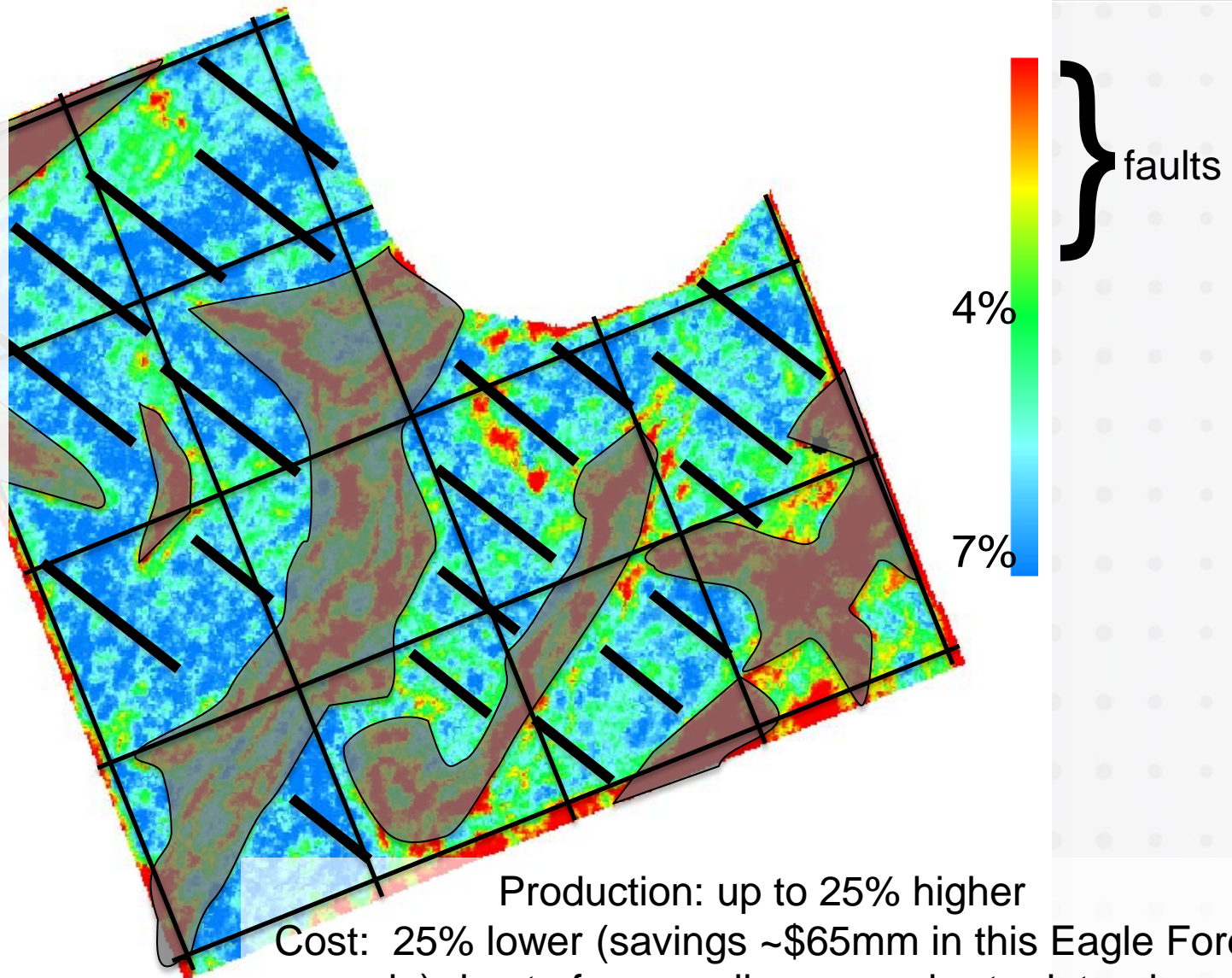
- Wells are drilled through faults
- All frac stages are exercised
- Some very good wells and some very poor wells are drilled as a result





Hypothetical results using evidence-based drilled resource play

- Wells are drilled primarily only in good TOC, away from faults
- Almost all frac stages are exercised
- All but one are very good wells as a result



Production: up to 25% higher
Cost: 25% lower (savings ~\$65mm in this Eagle Ford example) due to fewer wells, some shorter laterals and fewer frac stages.

Bumper stickers
are just too small



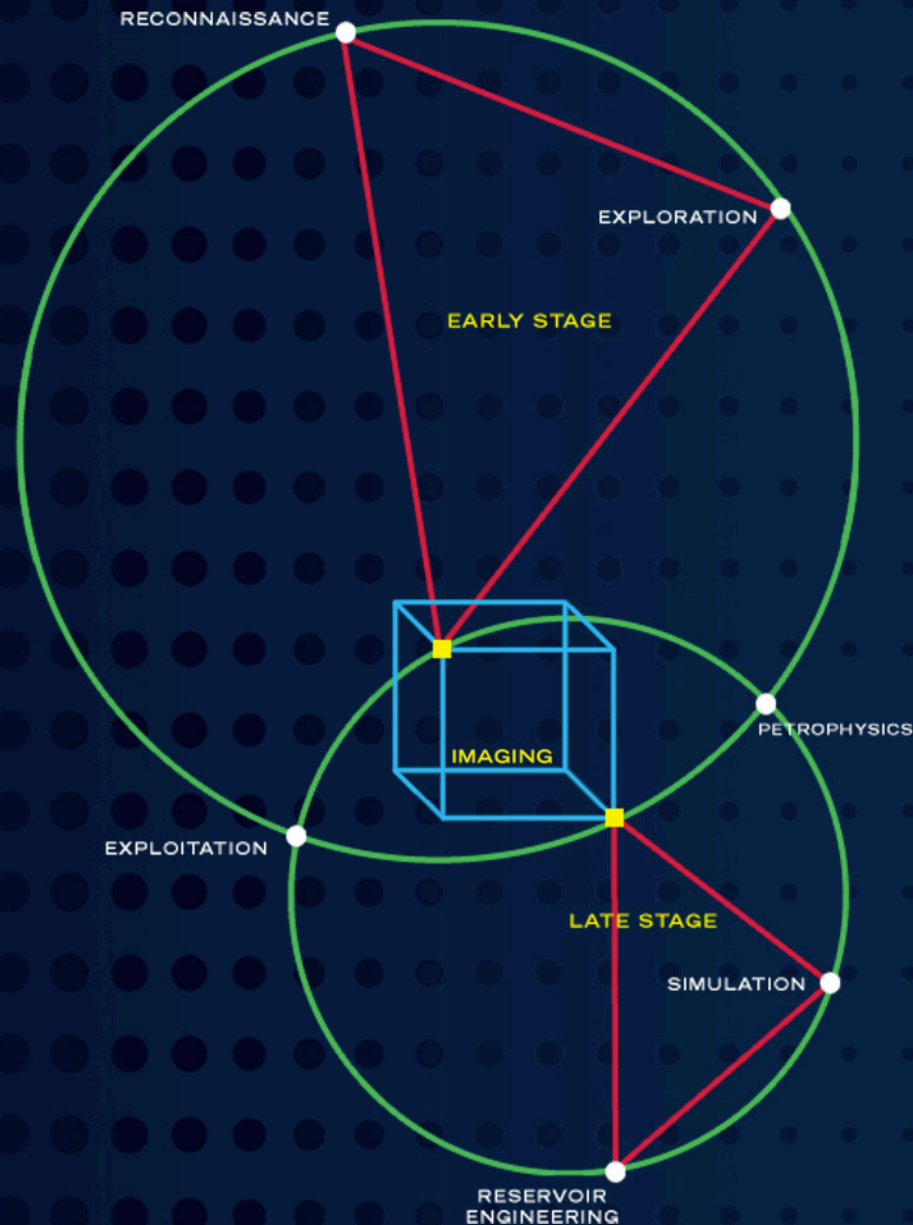
DRILL BABY DRILL!

**ALL THOSE
WELLS THAT
ARE GOING
TO MAKE
MONEY**

I ♥ Fracking

**THOSE STAGES
THAT HAVE
SUFFICIENT TOC
AND
BRITTLINESS**

Seismic was
always a good deal
And now it's a steal



Resource play costs (approximate)

Leasing (average)	\$8,000/acre
Drilling	\$50,000/acre
(4 wells/section, \$8mm drill and <u>complete</u>)	
	\$58,000/acre

Seismic Reservoir Analysis:

Analysis	\$6/acre
(PSTM/PSDM/OVT (Az. Frac.)/Pre-stack inversion/MVStats)	
Acquisition	<u>\$156/acre</u>
(using \$100,000/sq. mi.)	\$162/acre
<0.3% of leasing/drilling costs	

So?

- Even though companies are laying down rigs, and regardless of whether oil prices recover in the near future
- And whether the play is conventional or unconventional
- Acquiring new seismic or simply performing reservoir analysis on existing seismic will help to guide drilling and development for future wells and pay for itself many times over

Thank you

