

AV Evaluating and Hy-Grading Wolfcamp Shale Opportunities in the Midland Basin

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Abstract

This presentation is a review of the mapping techniques and shale-log petrophysics that led to the discovery of the Hammer-Rock Tank Area. This emerging unconventional play is located near the northeastern part of the Midland Basin near the Howard Borden County Line. Three rigs operated by Tall City Exploration and Element are currently drilling 1.5 mile horizontal wells to delineate benches in the upper Wolfcamp and Spraberry shale.

Reference Cited

Handford, C.R., 1981, Sedimentology and genetic stratigraphy of Dean and Spraberry formations (Permian), Midland Basin, Texas: AAPG Bulletin, v. 65/9, p. 1602-1616.

Evaluating and Hy-Grading Wolfcamp Shale Opportunities in the Midland Basin

- Horizontal Drilling Boom
- Recent Drop in Oil Price
- Tall City Exploration and one of our plays
- Tools and Applications

The Boom in the Permian Basin!

- Heavy Truck Traffic
- Man Camps
- Outrageous Hotel and Apartment Rates
- Lowest Unemployment Rate in the Country
- Cooling Down With Lower Prices

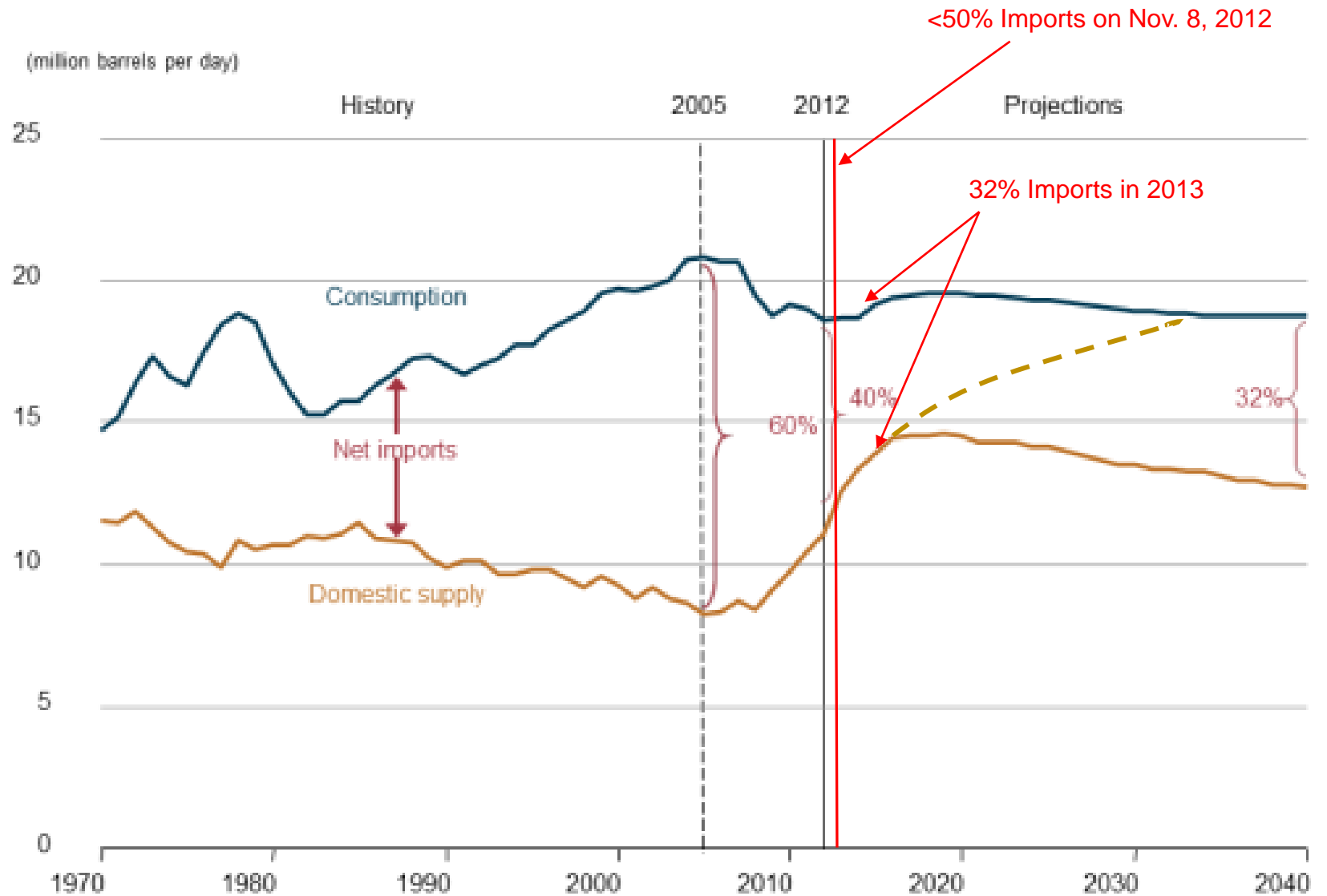
❑ 2005 US imported 60% of oil consumption.

❑ Nov. 8, 2012 US produced more oil than it imported.

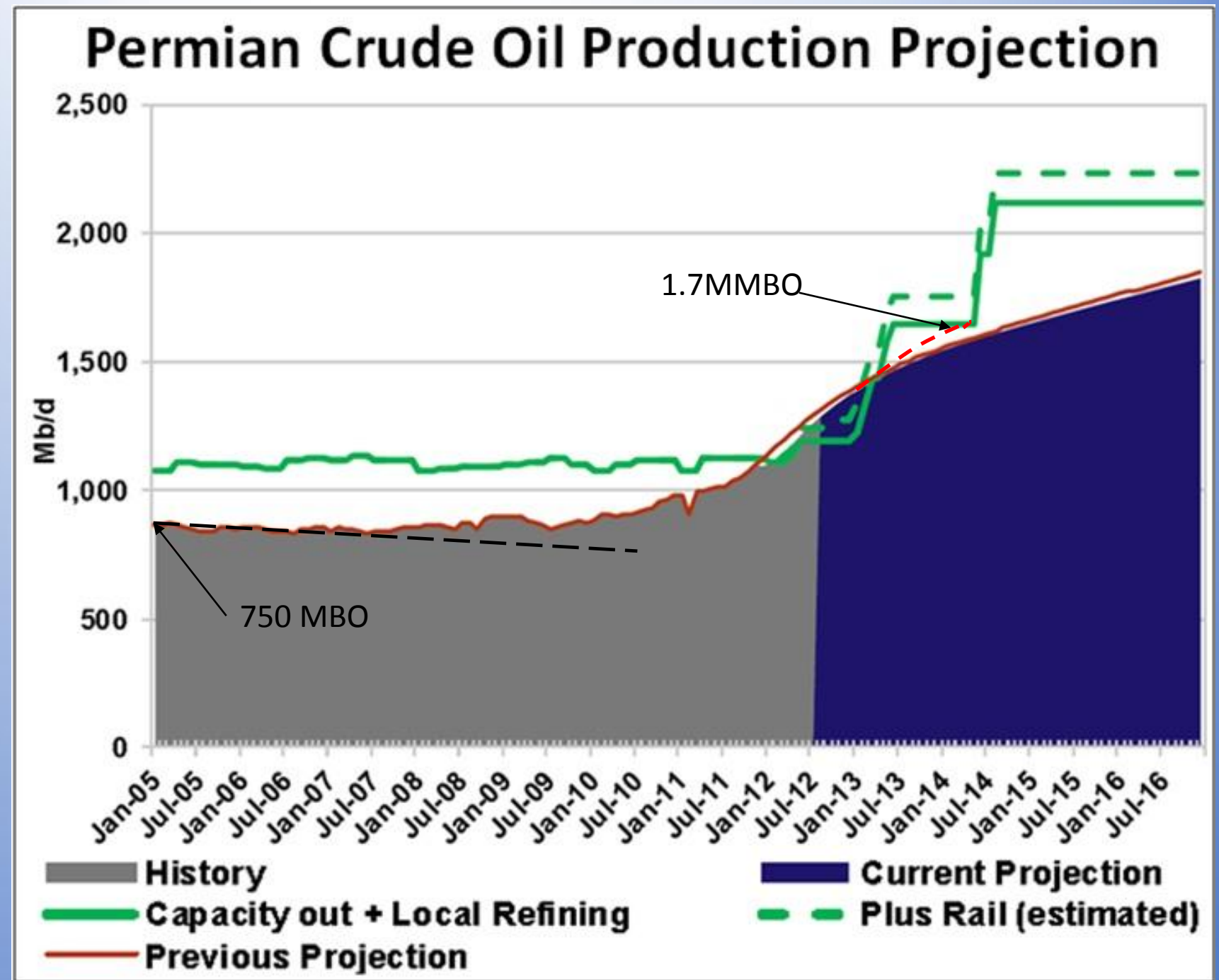
❑ 2012 US imported 40% Oil Consumption.

❑ 2013 US imported 32% Oil consumption.

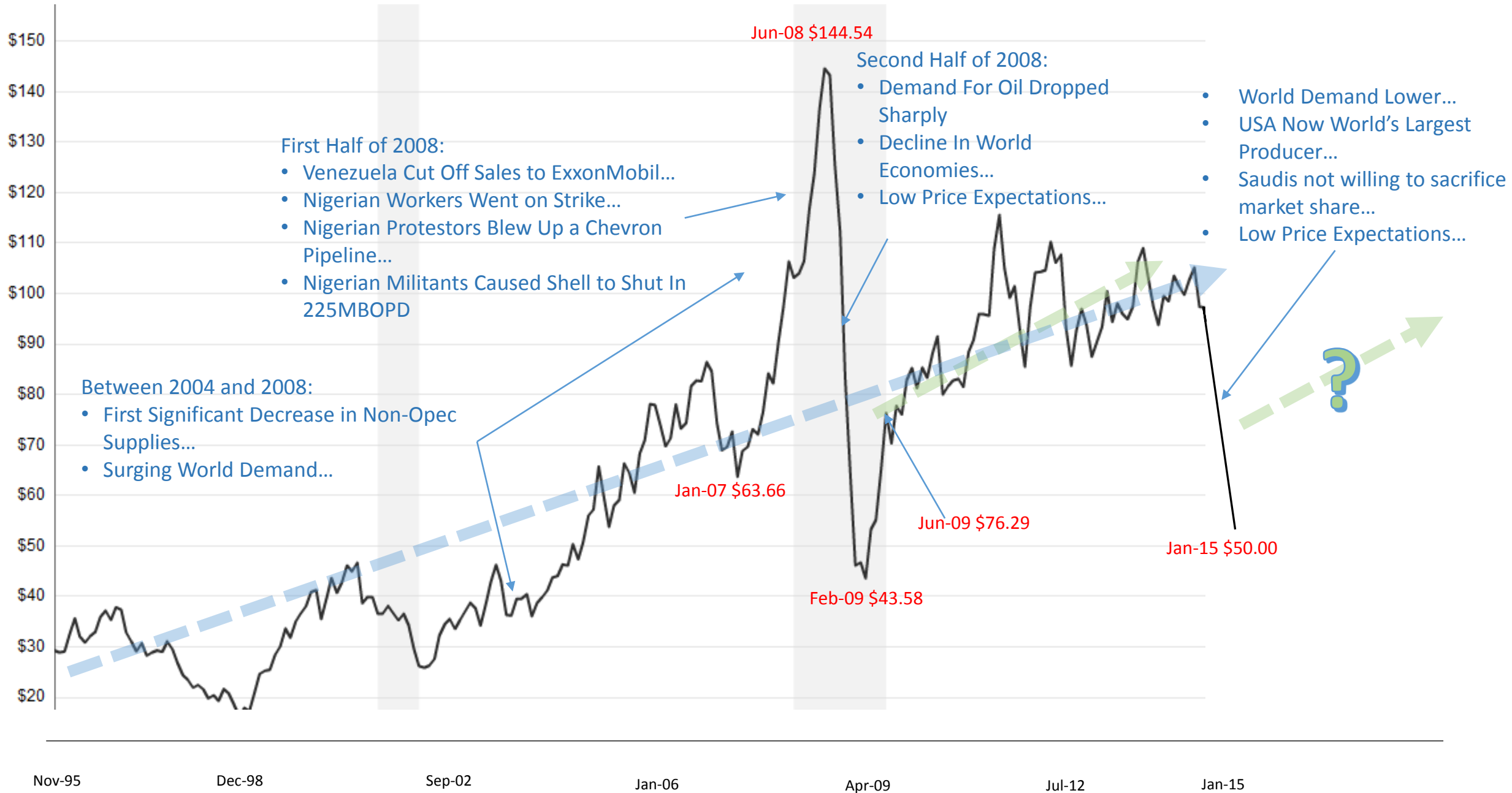
Figure 12. U.S. petroleum and other liquid fuels supply, 1970-2040



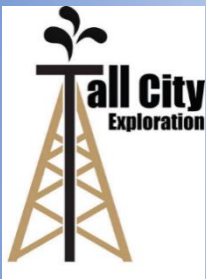
- ❑ 2005 Permian Basin Produced 0.75 MMBO
- ❑ 2013 Permian Basin Produced 1.3 MMBO and inclining sharply.
- ❑ Now we are about 1.7 MMBO and Need Rail to Move Oil Out.



20-Year History Of WTI Oil Price



Who is Tall City Exploration?



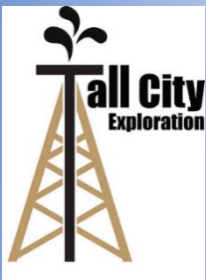
Management Team Biographies

Yrs. Extensive Prior Industry Experience

Exp.

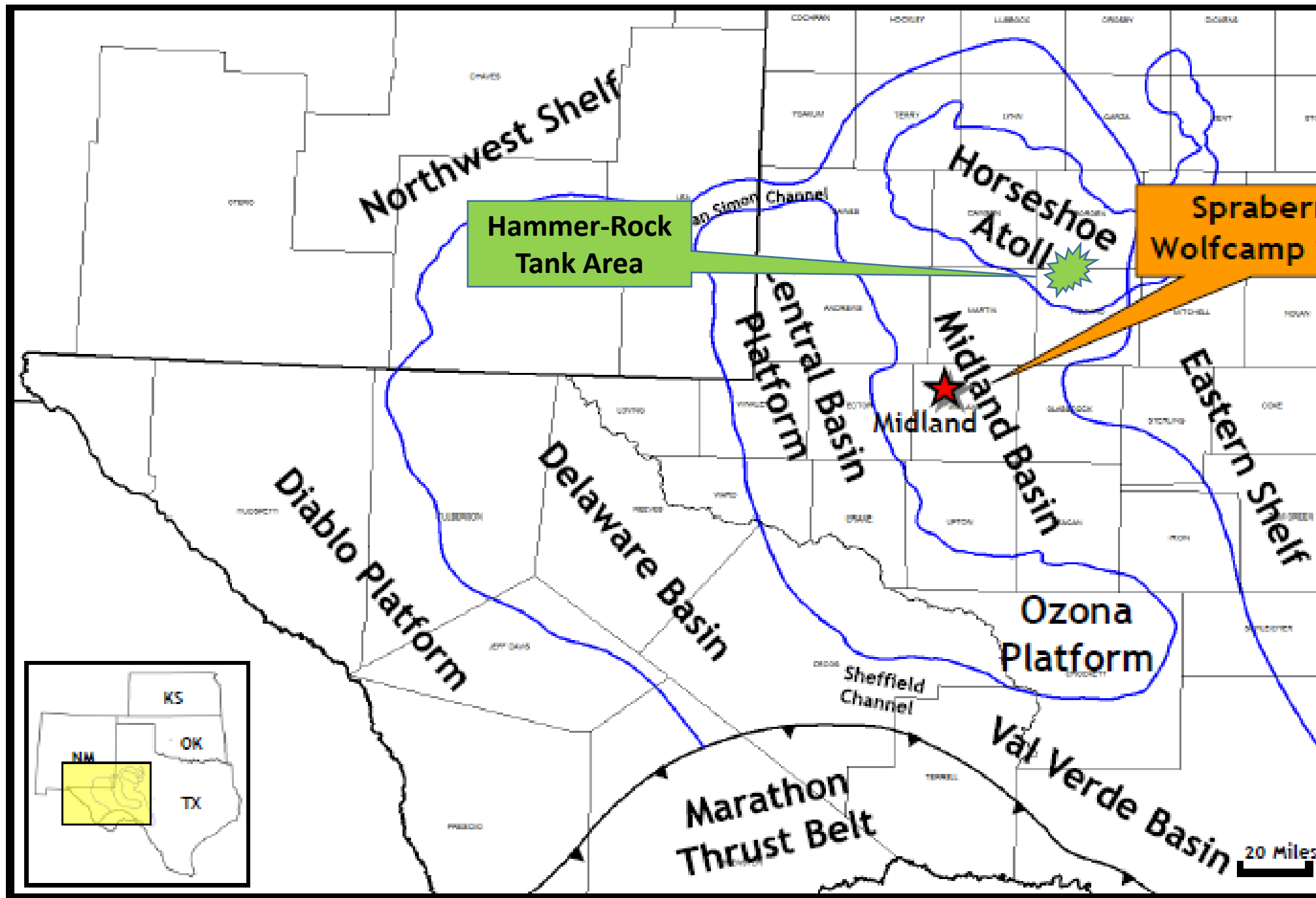
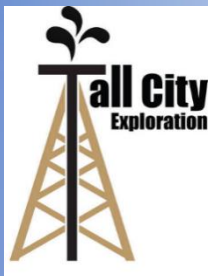
Professional Biography

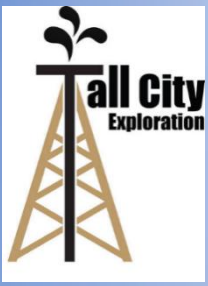
<u>Name/Title</u>	<u>Yrs.</u> <u>Exp.</u>	<u>Professional Biography</u>
Mike Oestmann <i>Chief Executive Officer</i>	31	<ul style="list-style-type: none"> Worked 15 years with Exxon, 7 years with Titan/Pure Resources/Unocal, 2 years with Celero/Whiting in various exploration, development and senior management positions Co-founded Piedra Resources in 2007 with private equity partners. Piedra sold to Berry Petroleum in 2011 for >\$120MM
Joe Magoto <i>President</i>	41	<ul style="list-style-type: none"> Formerly Partner and COO of Vintage and former Chief Technical Officer of Parkman Whaling, LP Previously Managing Senior Vice President and a member of the Board of Directors at Ryder Scott Company Began his career at Exxon for a term of 5 years, where he supervised the Corpus Christi District reservoir team
Michael Marziani <i>Chief Financial Officer</i>	15	<ul style="list-style-type: none"> Spent over ten years in investment banking with Greenhill & Co. and Merrill Lynch advising energy clients regarding mergers & acquisitions and debt & equity underwriting transactions Began career as reservoir and petroleum engineer with BP
Ed Gibbon <i>Vice President – Res. Eng.</i>	46	<ul style="list-style-type: none"> Previously served as Senior Vice President at Ryder Scott Company, L.P. Began his professional career with Tenneco Oil Company, followed by employment at Pogo Producing Company, North Central Oil Corporation and Texas General Petroleum Corp.
Dennis Kruse <i>Vice President - Drilling</i>	32	<ul style="list-style-type: none"> Spent the first 15 years of his career with Gulf Oil Company and Chevron in the Permian Basin Formed Drillmark Consulting, an Engineering and Wellsite consulting firm in 1997 and merged the firm with EPI Consultants Prior to joining Tall City, had been an independent Project Manager/Operator/Partner in several areas of Texas
Darryl James <i>Vice President - Exploration</i>	44	<ul style="list-style-type: none"> After three years as a U.S. Army helicopter pilot, spent 6 years at Exxon and 13 years with Southland Royalty Company Later, served as President of M. L. Cass Company and became an independent oil and gas consultant in 1990 In 2008, H. L. Brown, Operating invited him to become their Geo-science advisor
Gary Womack <i>Vice President - Operations</i>	22	<ul style="list-style-type: none"> Spent 10 years as engineer with Oxy with focus on Permian Basin Left Oxy as an Engineering Advisor in 2002 to join Chi Energy where his focus included acquisition and implementation of drilling and producing projects in Texas and New Mexico
Angela Staples <i>Vice President – Land and Legal</i>	10	<ul style="list-style-type: none"> Began her legal career at Cotton, Bledsoe, Tighe & Dawson, P.C., in Midland, Texas practicing in litigation Joined three other attorneys and opened a new law firm, where she where she focused on both large oil and gas operators Senior Attorney at Davis, Gerald and Cremer, P.C. and serves as General Counsel to the Permian Basin Petroleum Assoc.



Tall City Highlights

- ❑ Control 84,000 net acres, 1,400+ locations, 800+ MMBoe
- ❑ Drilled 27 horizontal wells
- ❑ Sold Reagan County Assets for \$430MM
- ❑ 22 wells producing
 - 7,355 BOEPD (Gross) @ 12/28/2014
 - 5,354 BOEPD (Net) @ 12/28/2014
- ❑ New Record IP – 1,594 Boepd (24-hour)
- ❑ 3 net rigs currently running

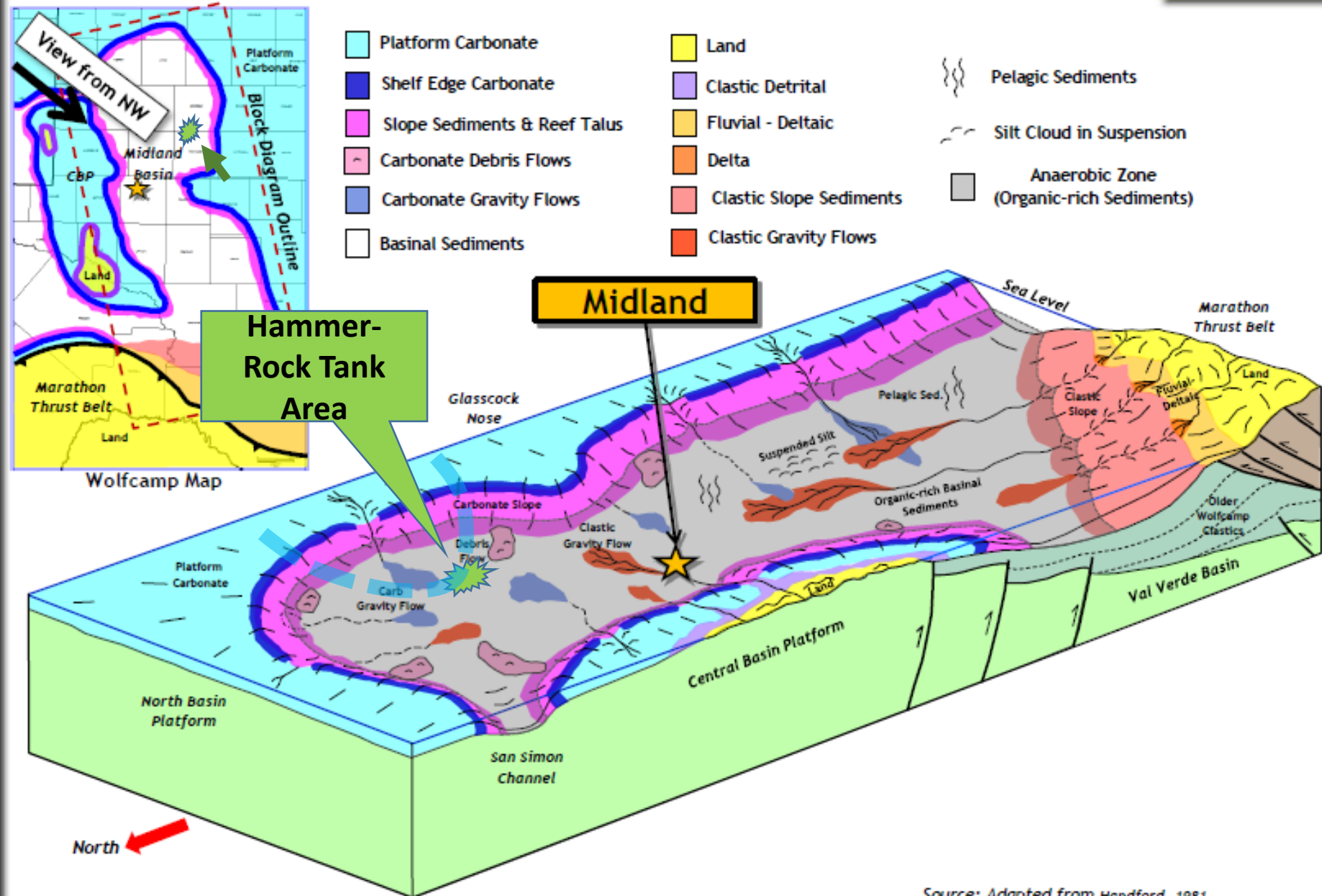




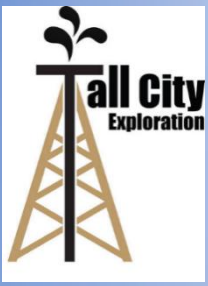
Wolfcamp Depositional Model - Midland Basin

PIONEER
NATURAL RESOURCES

- ❑ Wolfcamp consists largely of organic-rich deep water sediments.
- ❑ Correlative throughout the Midland Basin.
- ❑ Upper Wolfcamp unaffected by Horseshoe Atoll.
- ❑ Lower Wolfcamp thins across Atoll.



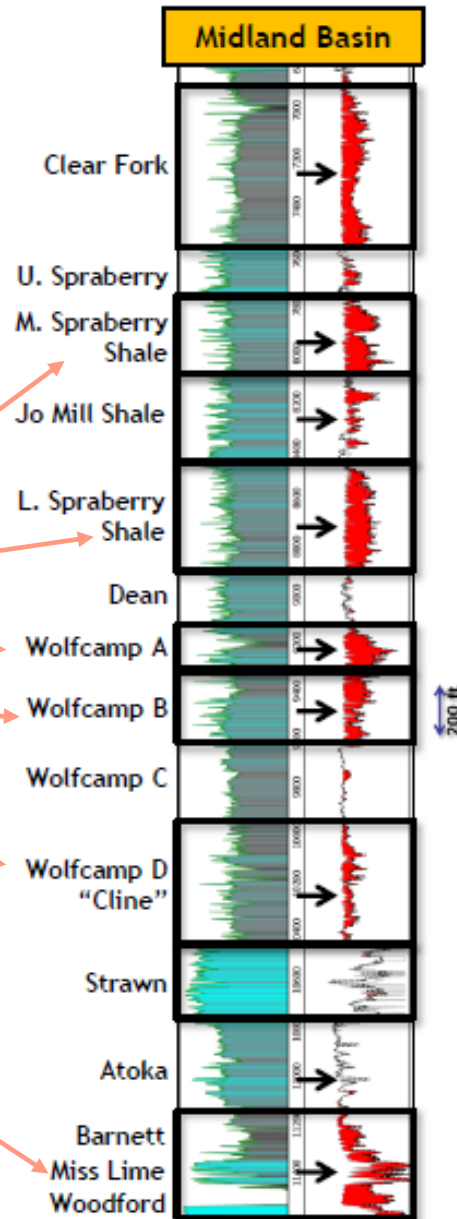
Source: Adapted from Handford, 1981



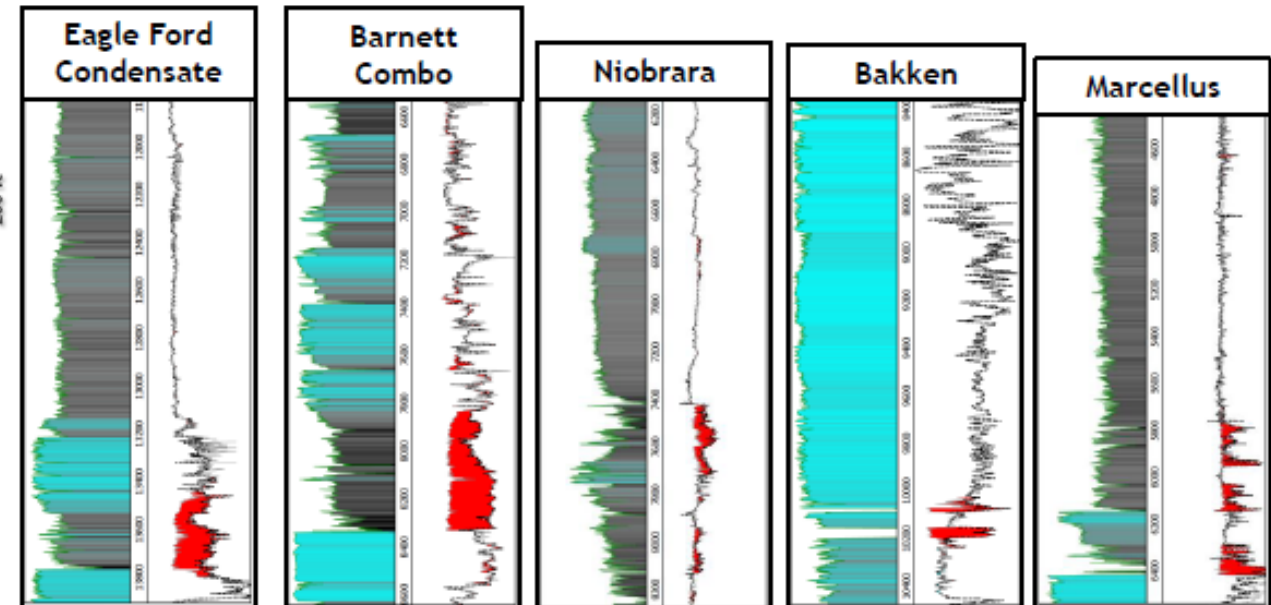
Midland Basin: Stacked Play Potential

Midland Basin Stacked Shale Resource Pays:

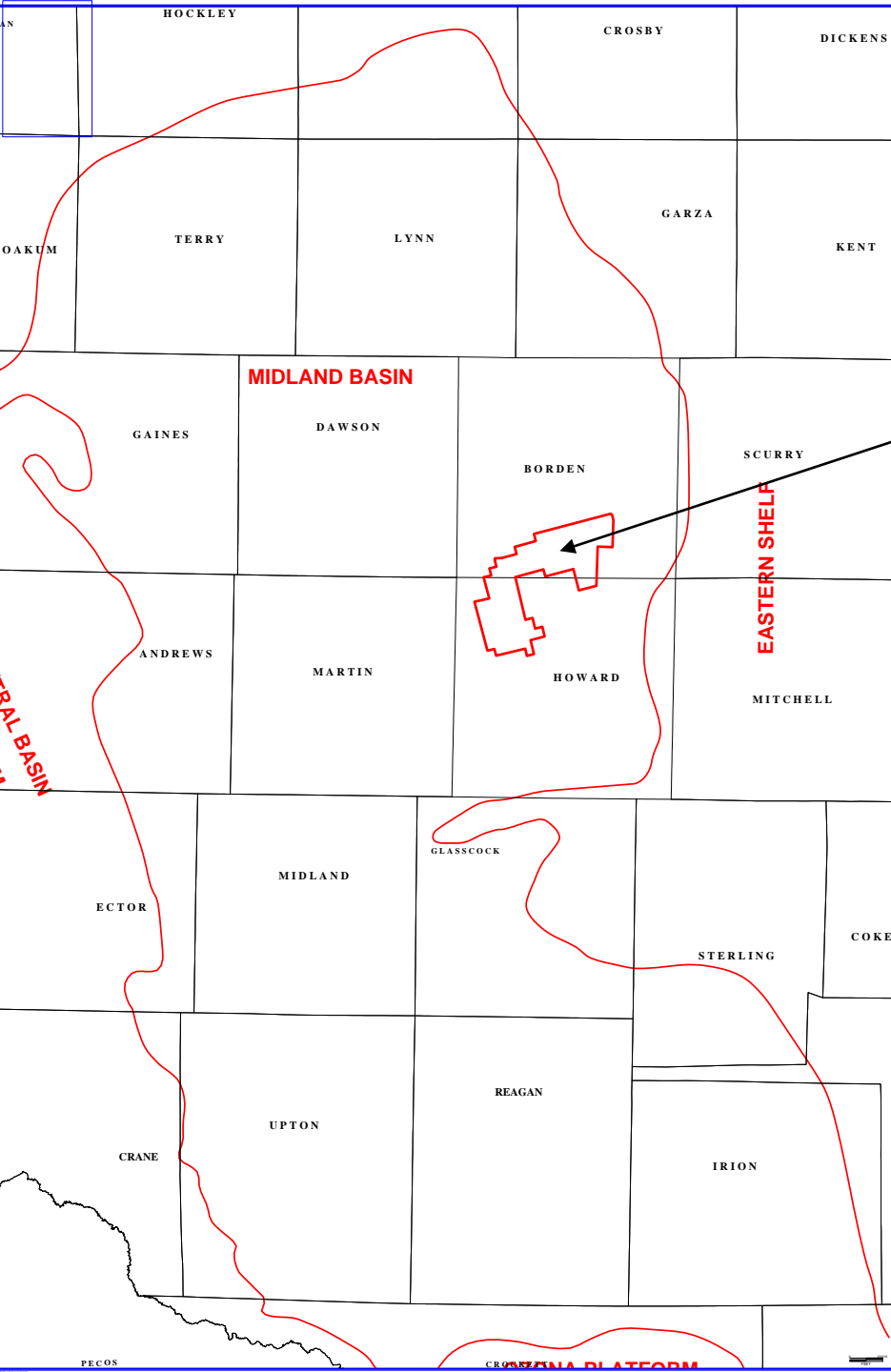
- ☐ Middle Spraberry Shale
- ☐ Leonard Shale
- ☐ Wolfcamp A
- ☐ Wolfcamp B
- ☐ Wolfcamp C
- ☐ Wolfcamp D
- ☐ Miss Lime



- "Delta log R" (excess electrical resistance)
- Red intervals indicate hydrocarbons
- Petrophysical analysis indicates significantly more oil in place in the Wolfcamp and Spraberry Shale intervals in the Midland Basin compared to other major U.S. shale oil plays



Source: PXD

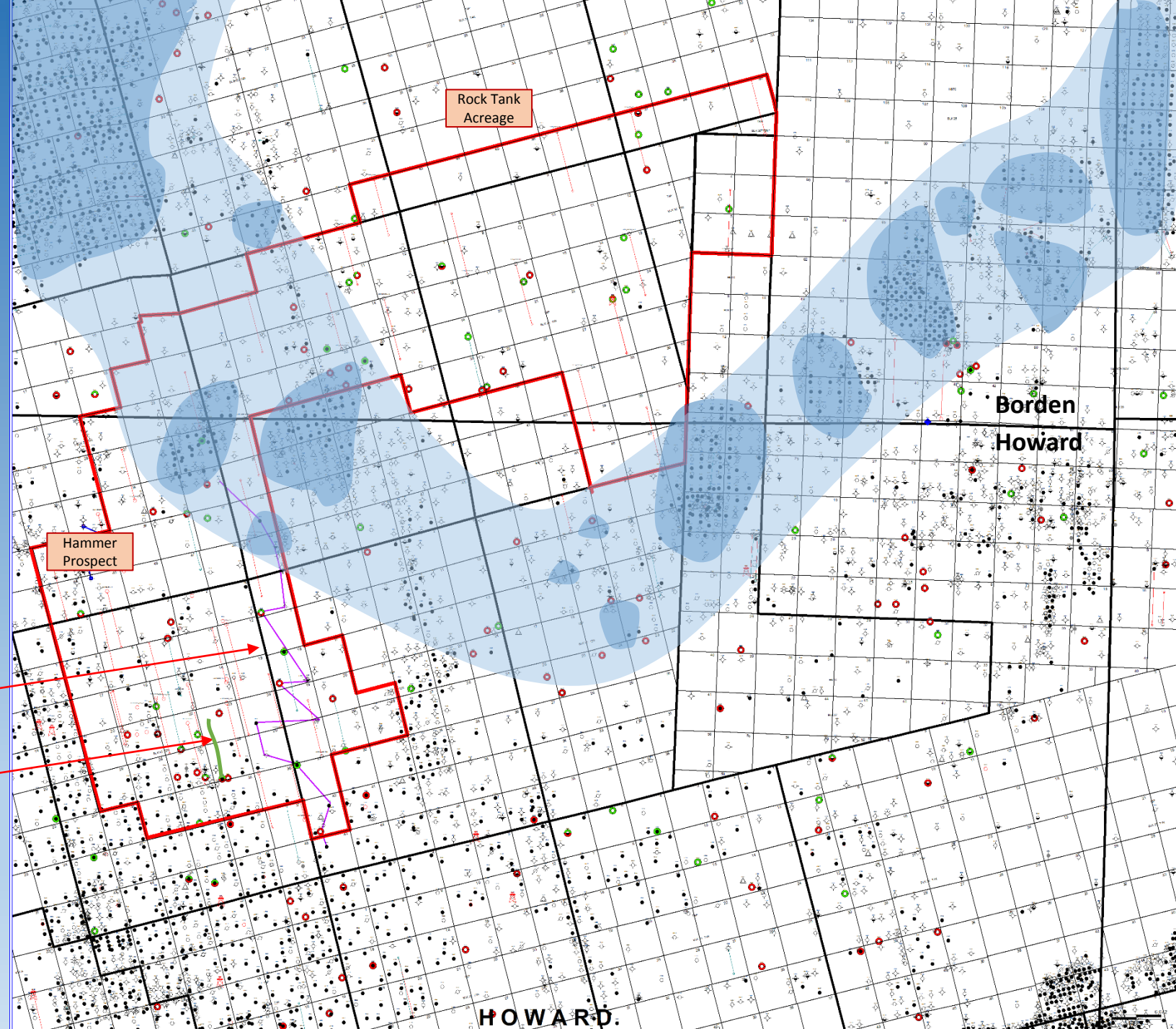
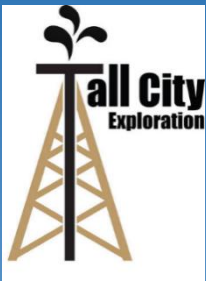


Hammer – Rock Tank Area

Howard and Borden County

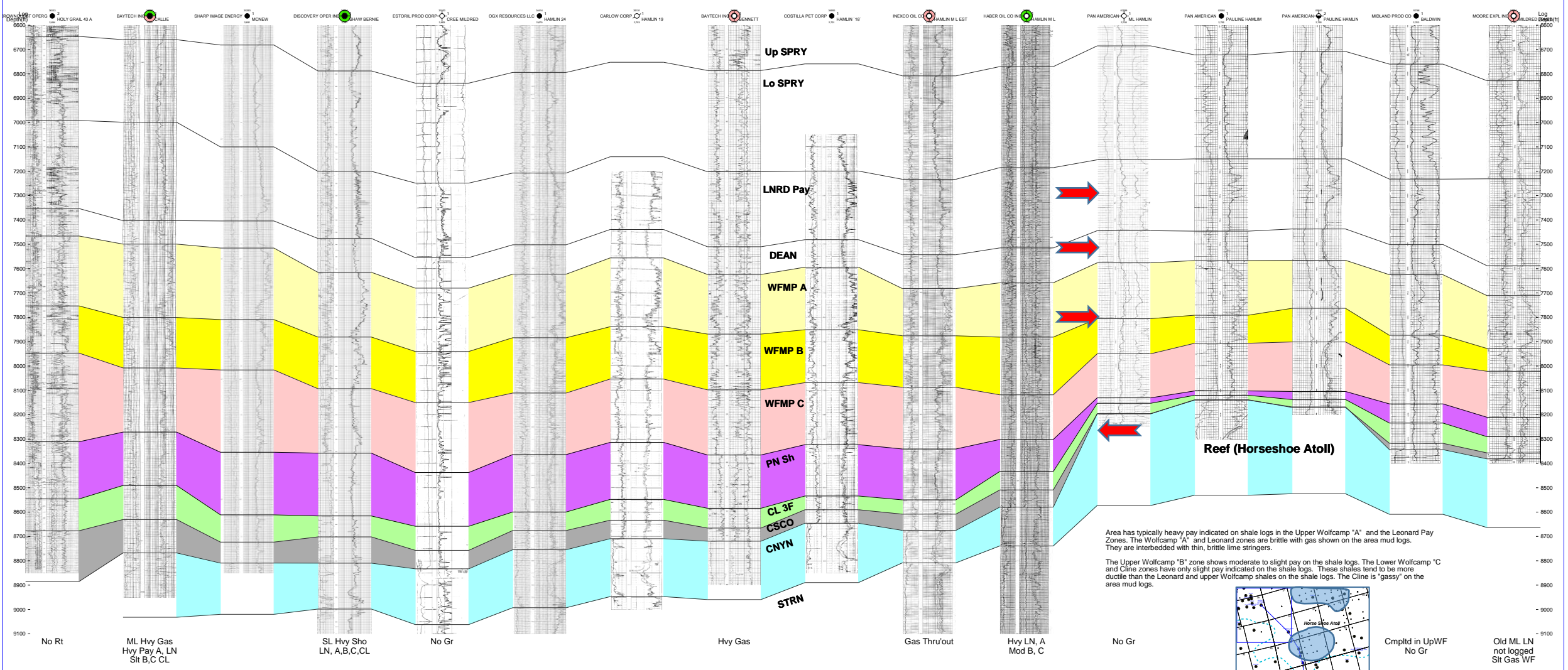
A New Developing Area in the Northern Midland Basin

- ❑ Tall City Leverages into a new, promising area...
- ❑ 68 Miles to nearest Horizontal Wolfcamp well...
- ❑ Agrees to risk \$10.5MM on 7500-Foot Wolfcamp Horizontal Well and acreage...
- ❑ Purchased 50% WI in 5000-acreage block...
- ❑ Acquires offsetting acreage...



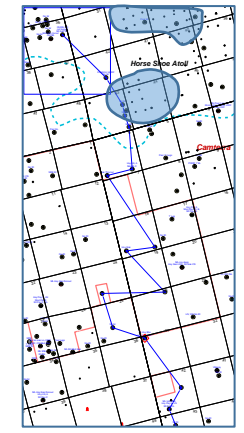
Line Of Cross Section

Discovery Well

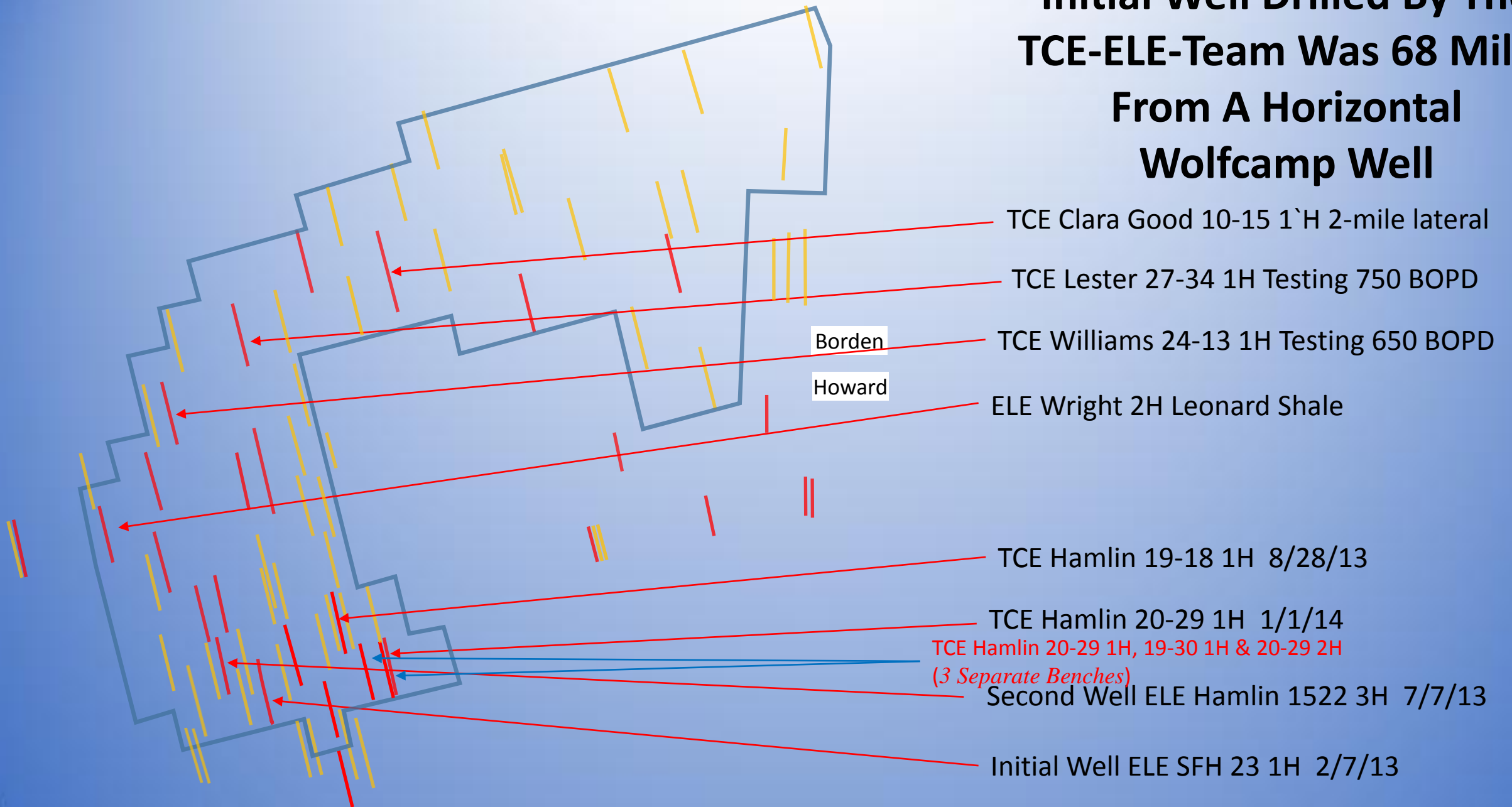


Area has typically heavy pay indicated on shale logs in the Upper Wolfcamp "A" and the Leonard Pay Zones. The Wolfcamp "A" and Leonard zones are brittle with gas shown on the area mud logs. They are interbedded with thin, brittle lime stringers.

The Upper Wolfcamp "B" zone shows moderate to slight pay on the shale logs. The Lower Wolfcamp "C" and Cline zones have only slight pay indicated on the shale logs. These shales tend to be more ductile than the Leonard and upper Wolfcamp shales on the shale logs. The Cline is "gassy" on the area mud logs.



Initial Well Drilled By The TCE-ELE-Team Was 68 Miles From A Horizontal Wolfcamp Well



Initial Well Drilled By The TCE-ELE-Team Was 68 Miles From A Horizontal Wolfcamp Well

TCE Clara Good 10-15 1`H 2-mile lateral

TCE Lester 27-34 1H Testing 750 BOPD

TCE Williams 24-13 1H Testing 650 BOPD

ELE Wright 2H Leonard Shale

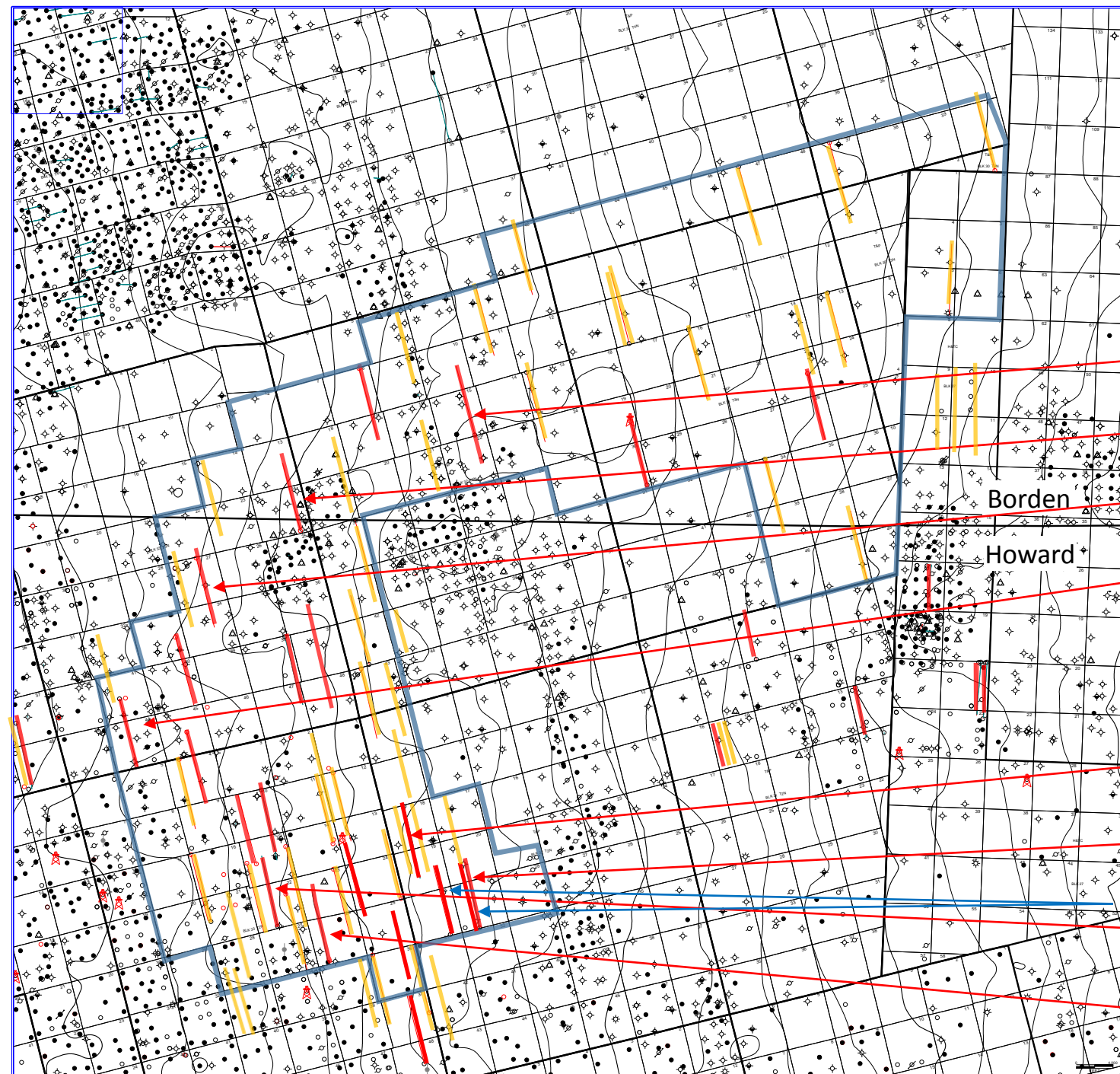
TCE Hamlin 19-18 1H 8/28/13

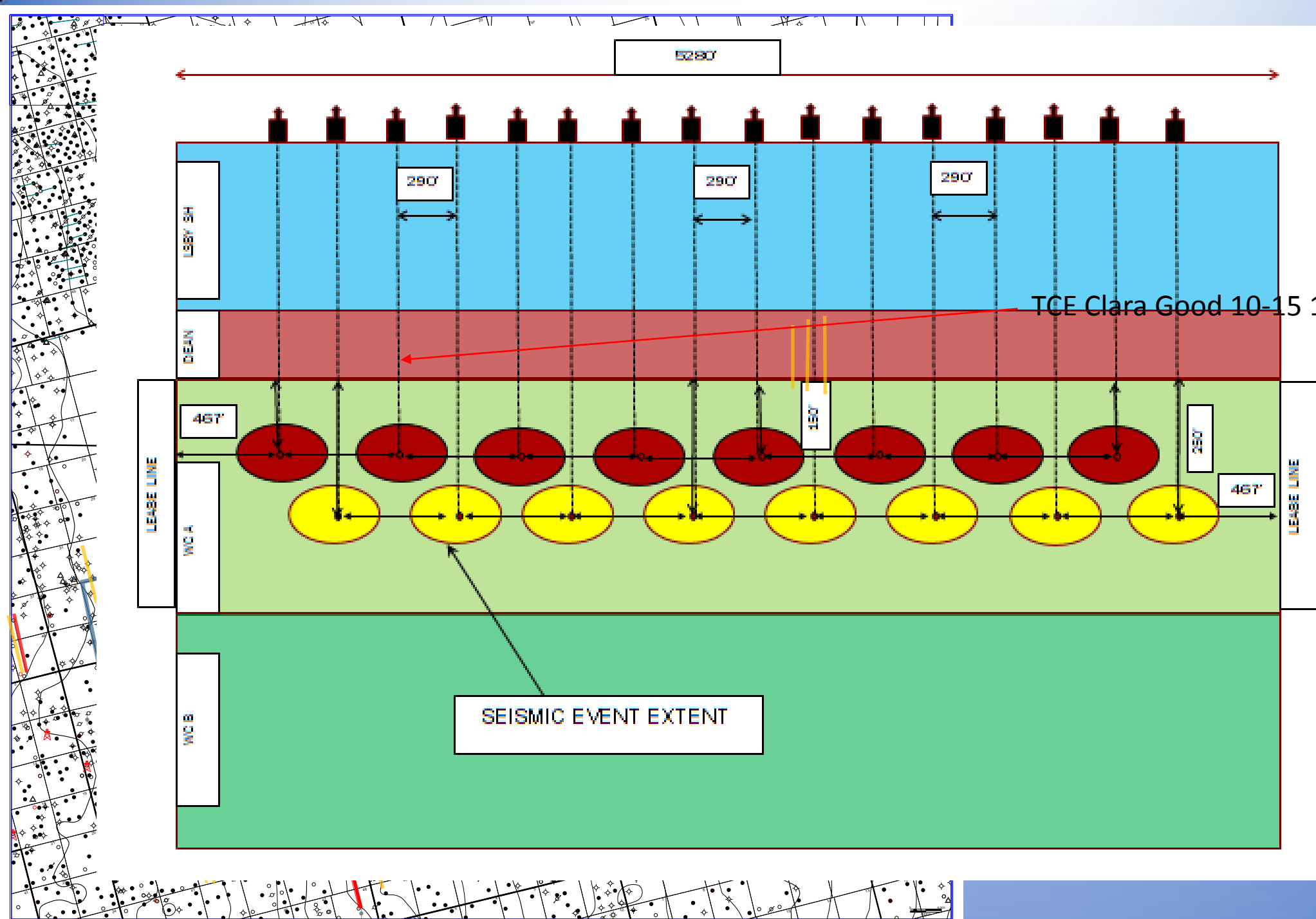
TCE Hamlin 20-29 1H 1/1/14

TCE Hamlin 20-29 1H, 19-30 1H & 20-29 2H

(3 Separate Wells) Hamlin 1522 3H 7/7/13

Initial Well ELE SFH 23 1H 2/7/13





illed By The
Was 68 Miles
horizontal
p Well

TCE Clara Good 10-15 1'H 2-mile lateral

ing 750 BOPD

sting 650 BOPD

ale

8/13

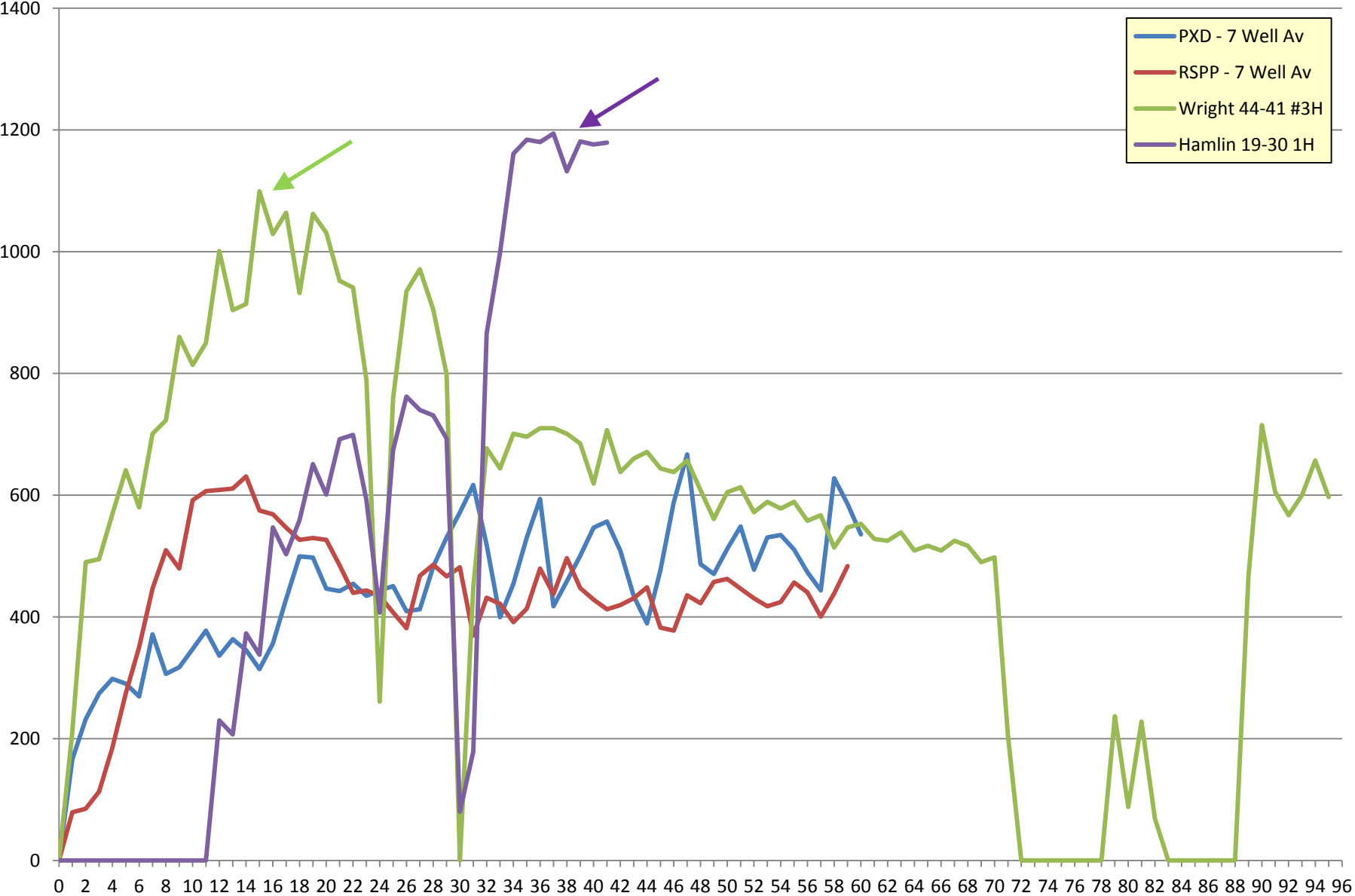
'14

& 20-29 2H

522 3H 7/7/13

2/7/13

Hamlin 19-30 1H Actual Prod. Vs. Industry Lower Spraberry Averages



Finding the “Sweet Spots”

Determine Amount of Pay

- ☐ Brittleness
- ☐ Kerogen Content
- ☐ Total Organic Content
- ☐ Shale Porosity
- ☐ Shale Permeability
- ☐ Shale Mineralogy
- ☐ Pay “Tells”

(Source Rock $\geq 0.5\%$ ' Shale Reservoir $\geq 2\%$),

Finding the “Sweet Spots”

Mapping the Pay Thickness

- ☐ Using Available Data
 - ☐ Core Data
 - ☐ Wireline Logs
 - ☐ Mud Logs
 - ☐ Computed Shale Logs

Determining Pay

Netting shale
with $R_t \geq 25 \text{ Ohms}$

LNRD

DEAN

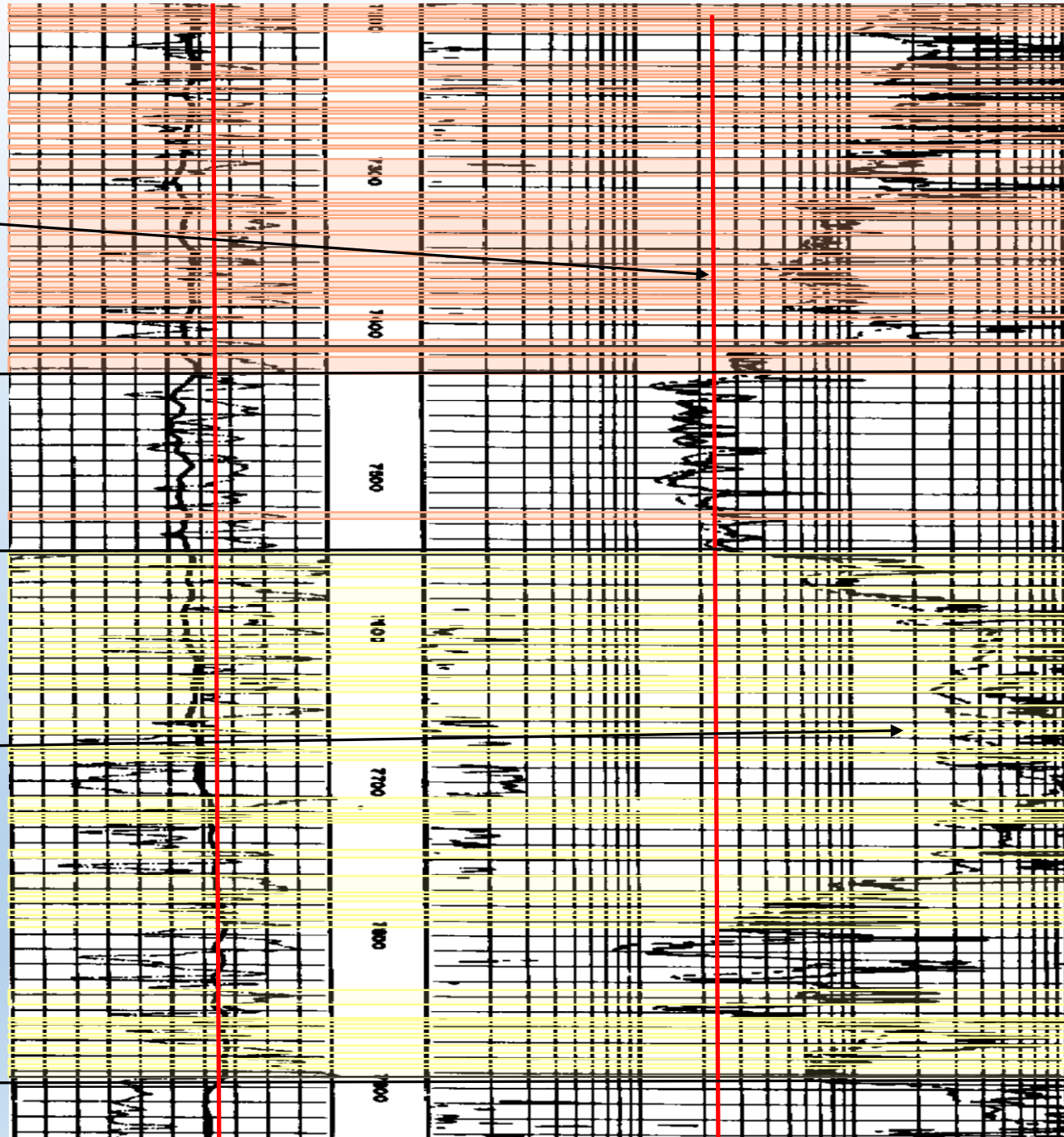
WFMP A

Characteristic
Upper WFMP
A "Resistivity
Bloom"

Using a Resistivity Log to Net Shale-Pay

WFMP B

"Resistivity
Blooms" are a
Shale-Pay
"Tell"

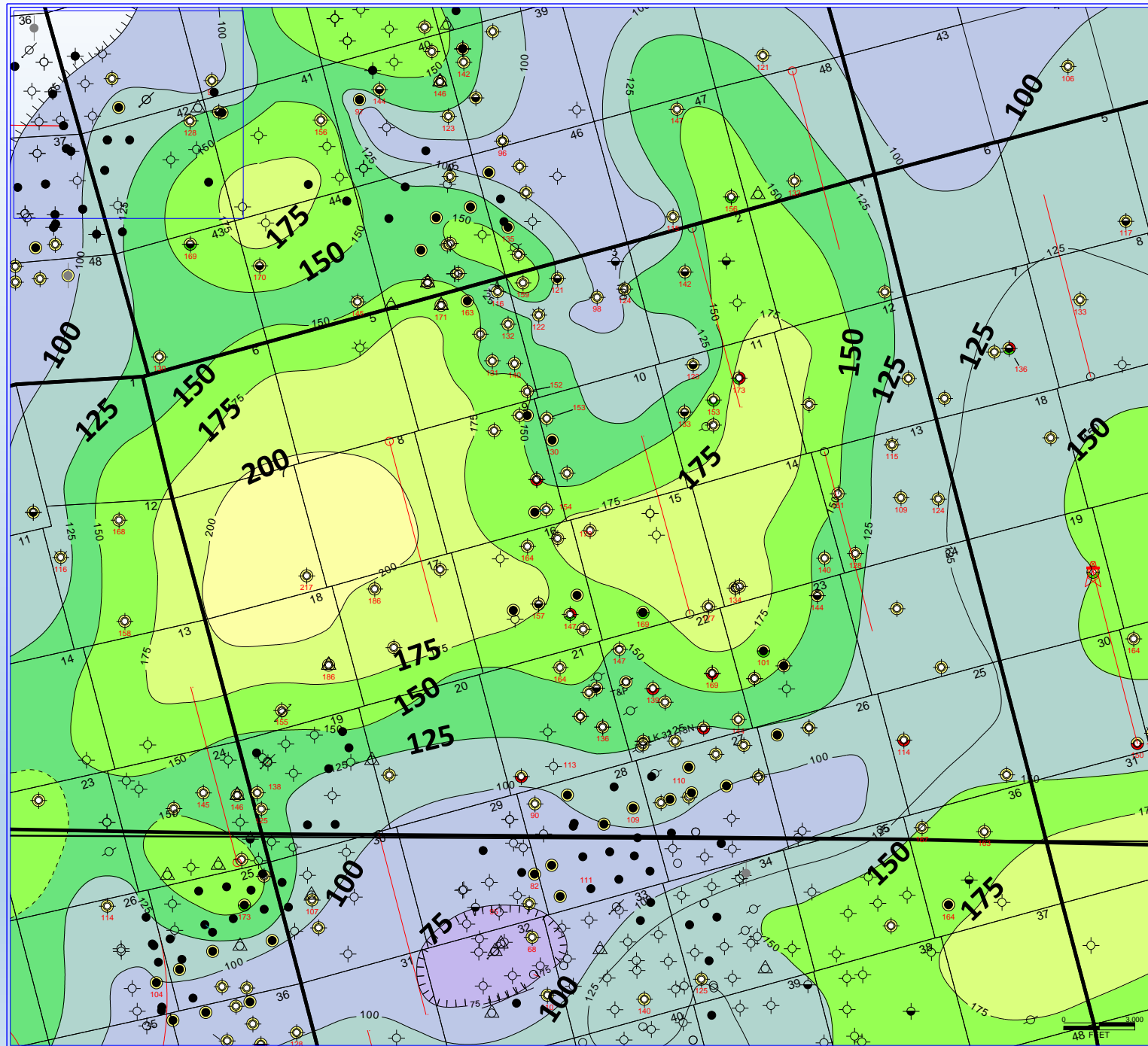


Using Open hole Logs

Example Isopach
Wolfcamp A Bench
Net Feet Shale Pay

$R_t \geq 25$ Ohms

- ☐ Compare Netted Pay Thicknesses to Shale Logs
- ☐ Utilizing Resistivity and Gamma Ray Logs
- ☐ 25 Ohm Cut-Off Works Well in A, B and C Benches
- ☐ In the D Bench a Cut-Off of 20 Ohms works better.



Determining Pay

DEAN

WFMP A

Brittle shale
(red)

Ductile shale
(green)

Frac Width

High Organic
Shale content
(Green)

Heavy
Kerogen
(black)

Heavy TOC
(yellow
and red)

Ductile Shale
Pinch Point"

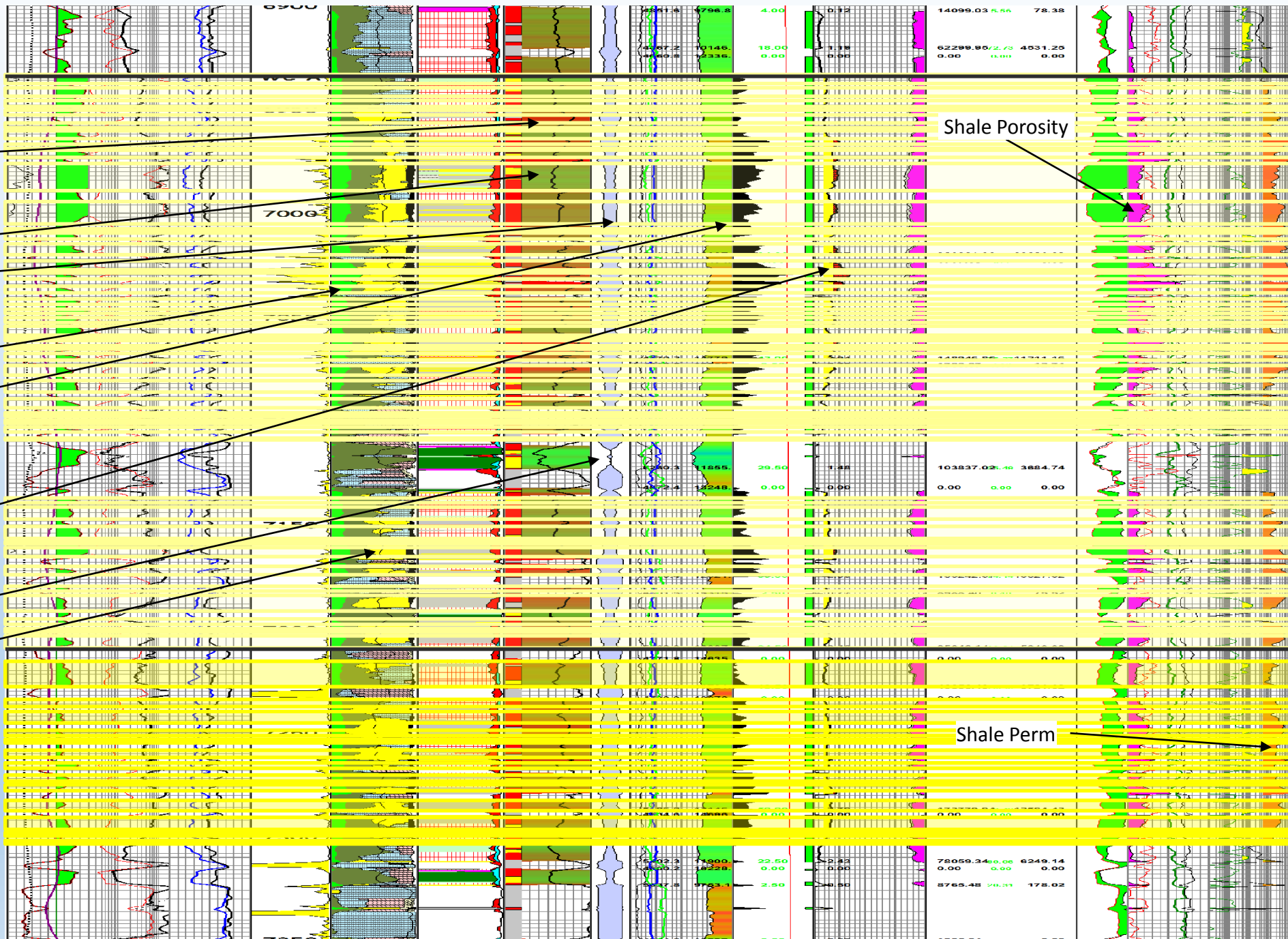
High silica
content
(Yellow)

WFMP B

Computed
"Shale Log"

Shale Porosity

Shale Perm



Determining Pay

DEAN
WFMP A

Shale Porosity

Brittle shale
(red)

Brittle Shale and Brittle
Limestone Interbedded
Facies

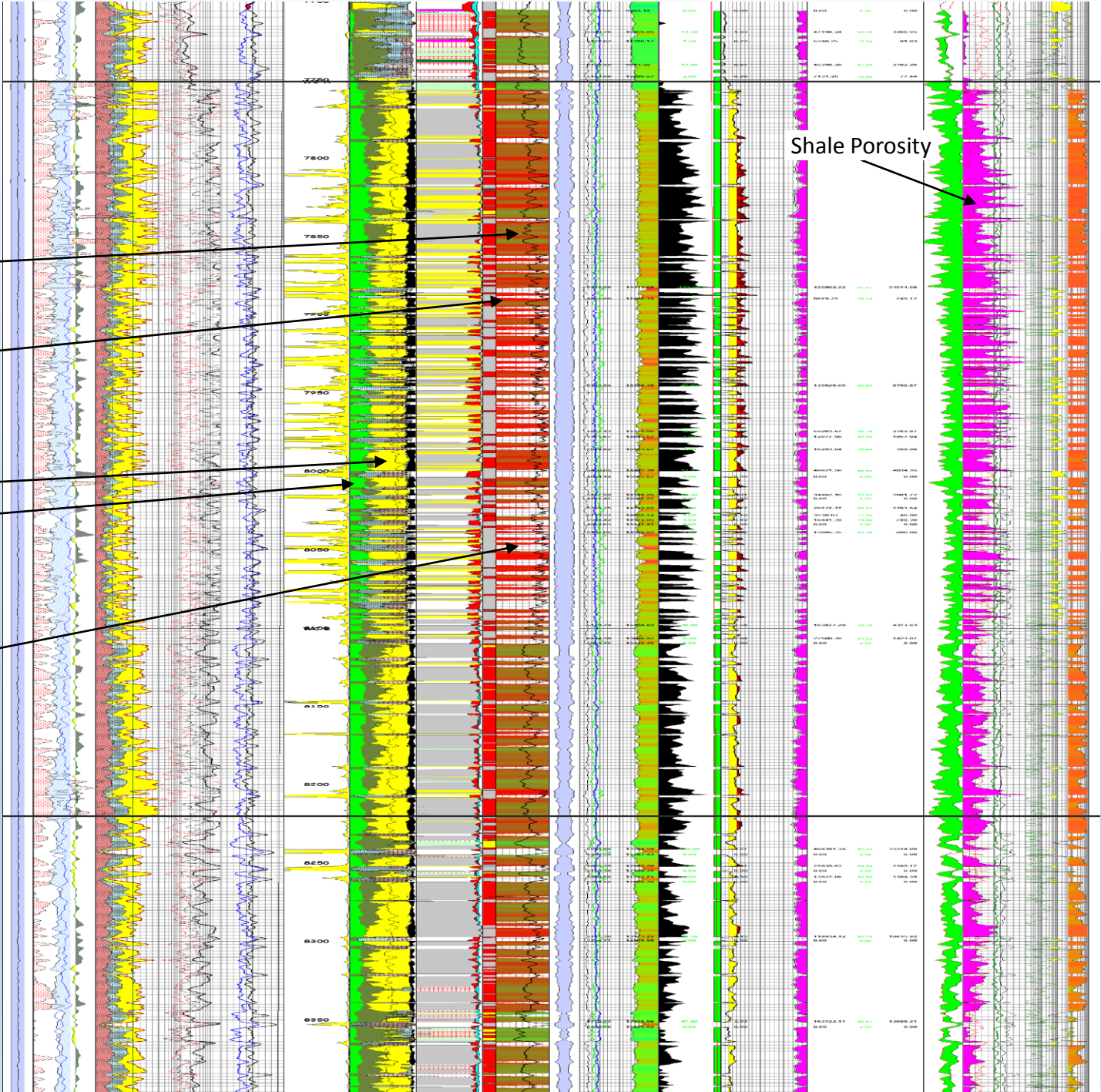
High Silica
Content

High Organic
Shale

Limestone Beds are
Oil Storage and
Transfer Points

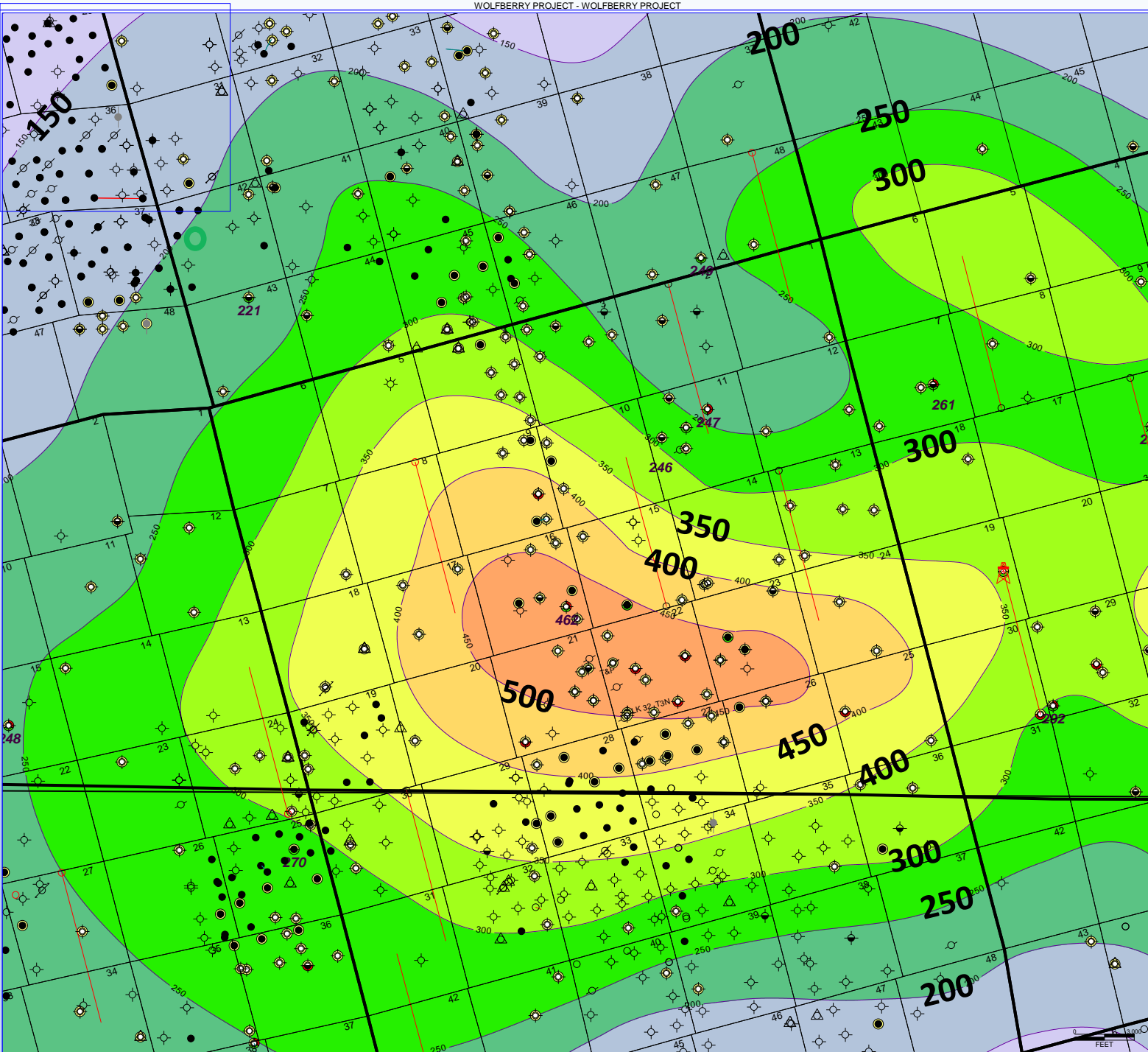
Computed “Shale Log”
With An Interbedded
Shale Limestone Facies
(A Shale-Pay “Tell”)

WFMP B



Mapping With “Shale Log Attributes”

- ❑ Net-Feet of total organic content (TOC) $\geq 2\%$
(*Source Rock $\geq 0.5\%$ ’ Shale Reservoir $\geq 2\%$*),
- ❑ Net-Feet of kerogen $\geq 2\%$ (*Arbitrary hy-grade*),
- ❑ Net-Feet of shale-porosity $\geq 2\%$ (*Pure shale has almost no porosity.*),
- ❑ Net-Feet of Brittleness $\geq 35\%$ (*Arbitrary hy-grade*),
- ❑ Ratio Britt $> 35\%$ /Britt $< 35\%$,
- ❑ AVG Shale Sw.



Mapping With Shale Log Attributes

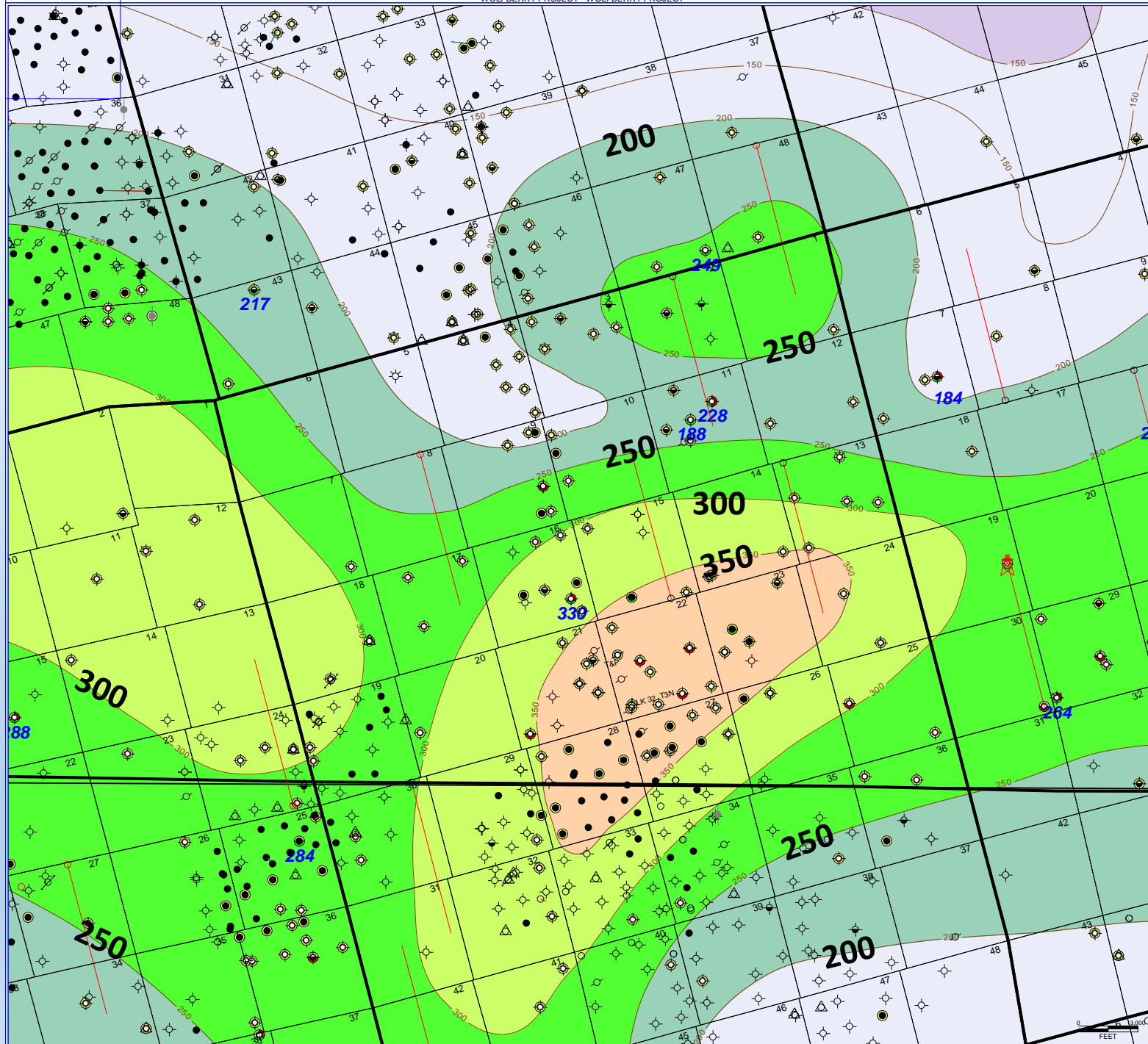
Wolfcamp A B Bench

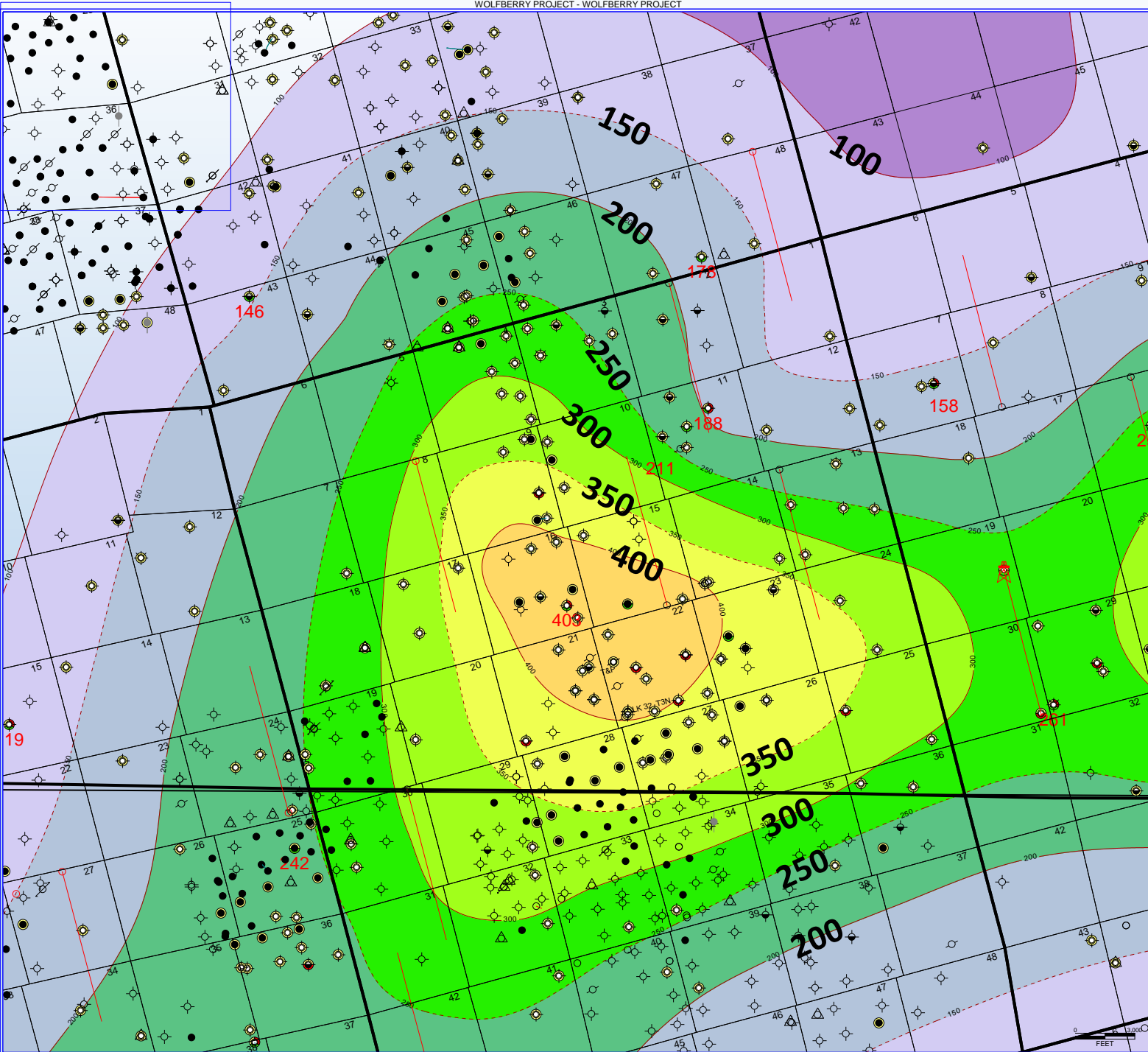
Net Feet Pay Isopach

TOC \geq 2%

Mapping With Shale Log Attributes

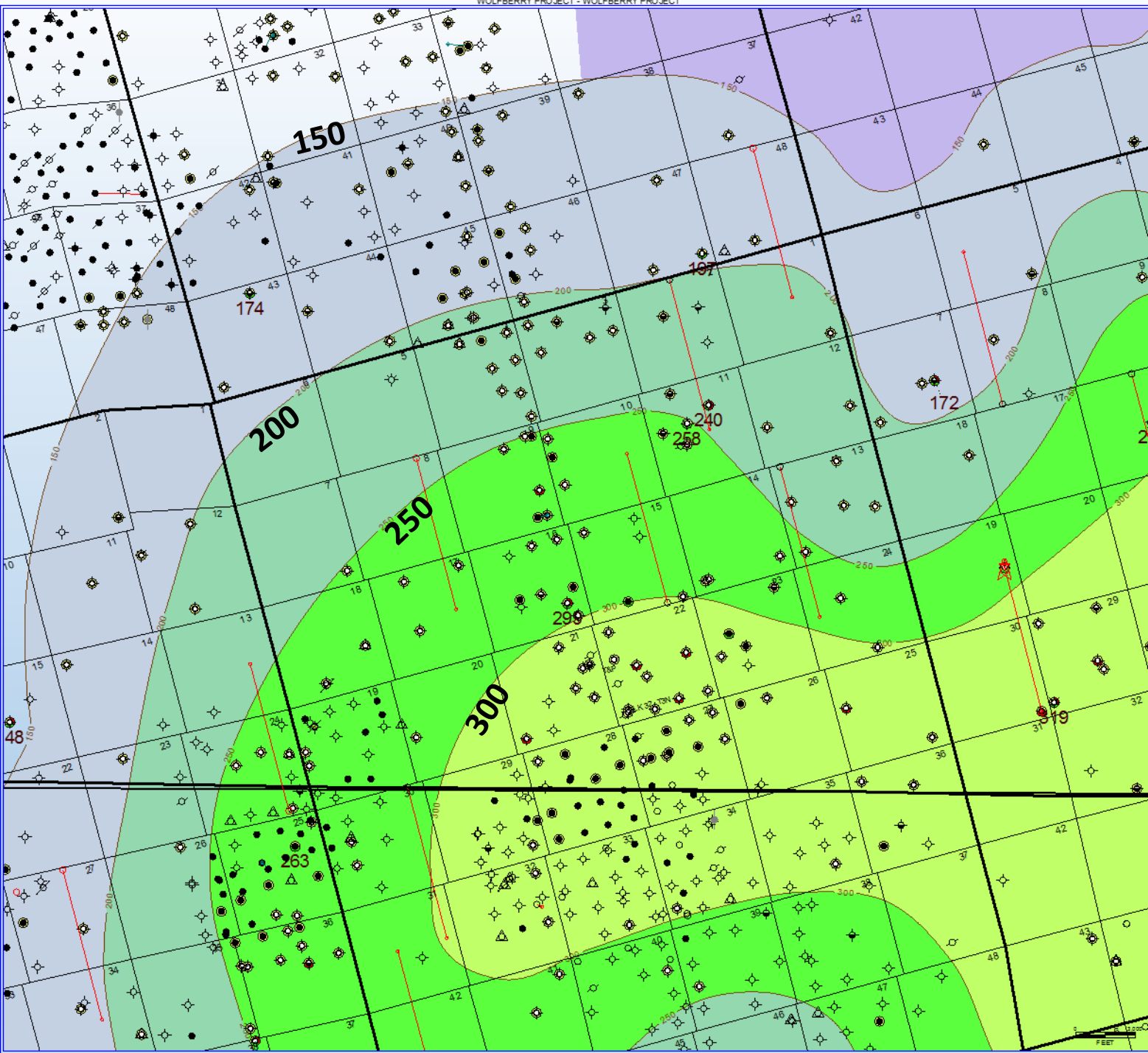
Wolfcamp A & B Benches
Net Feet Pay Isopach
Kerogen $\geq 2\%$





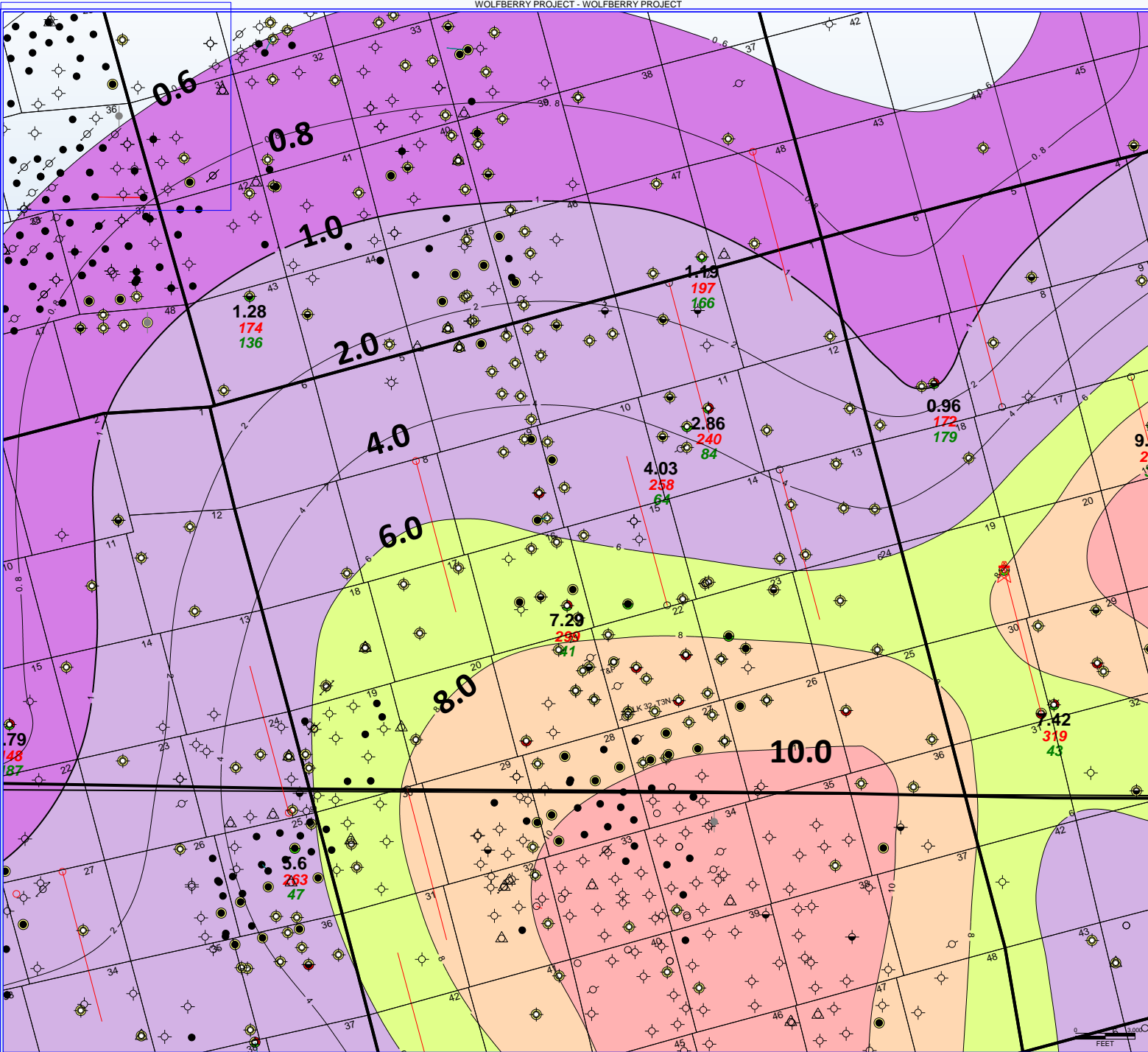
Mapping With Shale Log Attributes

Wolfcamp A & B Benches
Net Feet Pay Isopach
Shale Porosity $\geq 2\%$



Mapping With Shale Log Attributes

Wolfcamp A & B Benches
Net Feet Pay Isopach
Shale Brittleness $\geq 35\%$



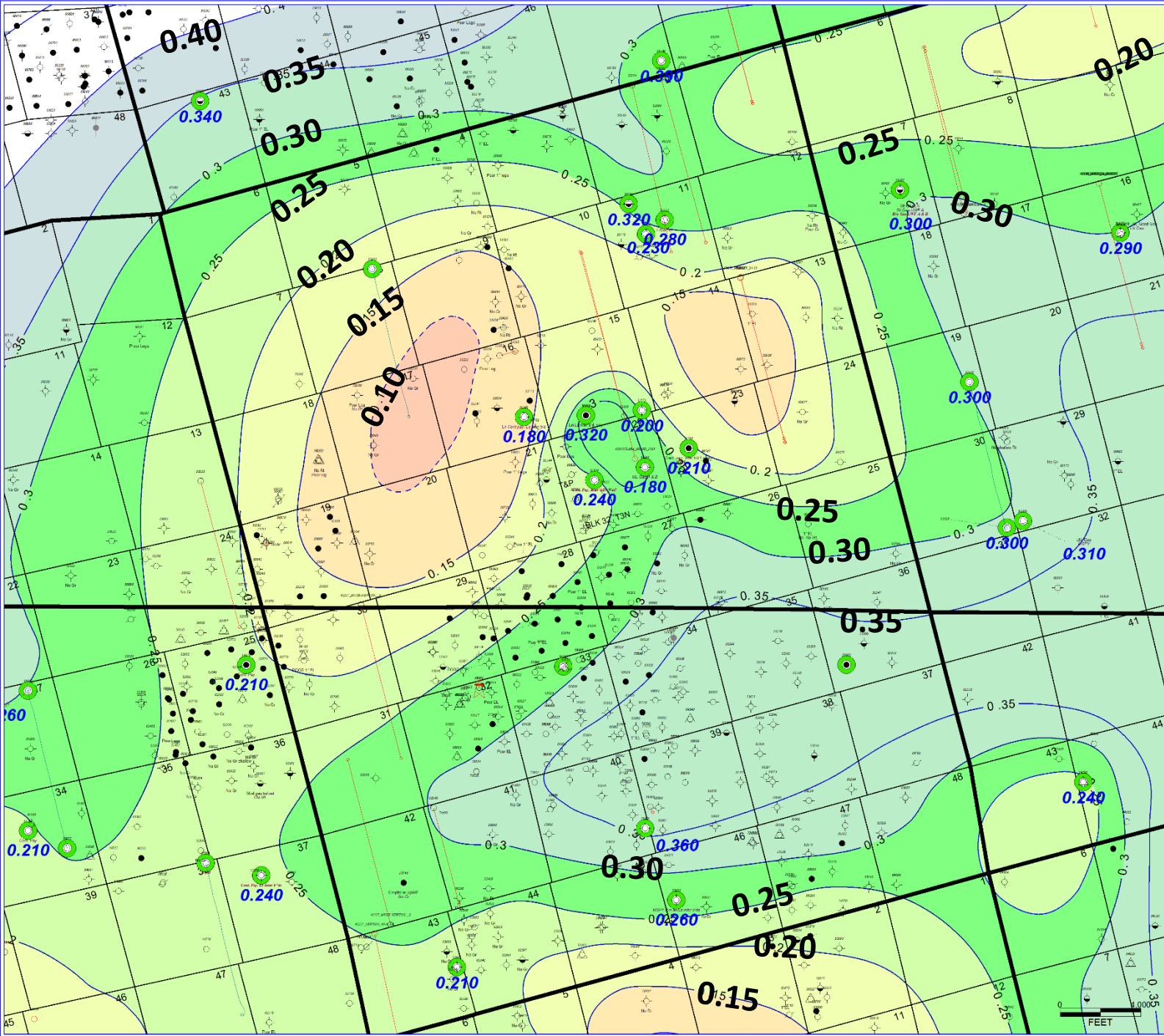
Mapping With Shale Log Attributes

Wolfcamp A & B Benches
Net Feet Pay Isopach

**Ratio of
Shale Brittleness $\geq 35\%$ /
Shale Brittleness $< 35\%$**

Mapping With Shale Log Attributes

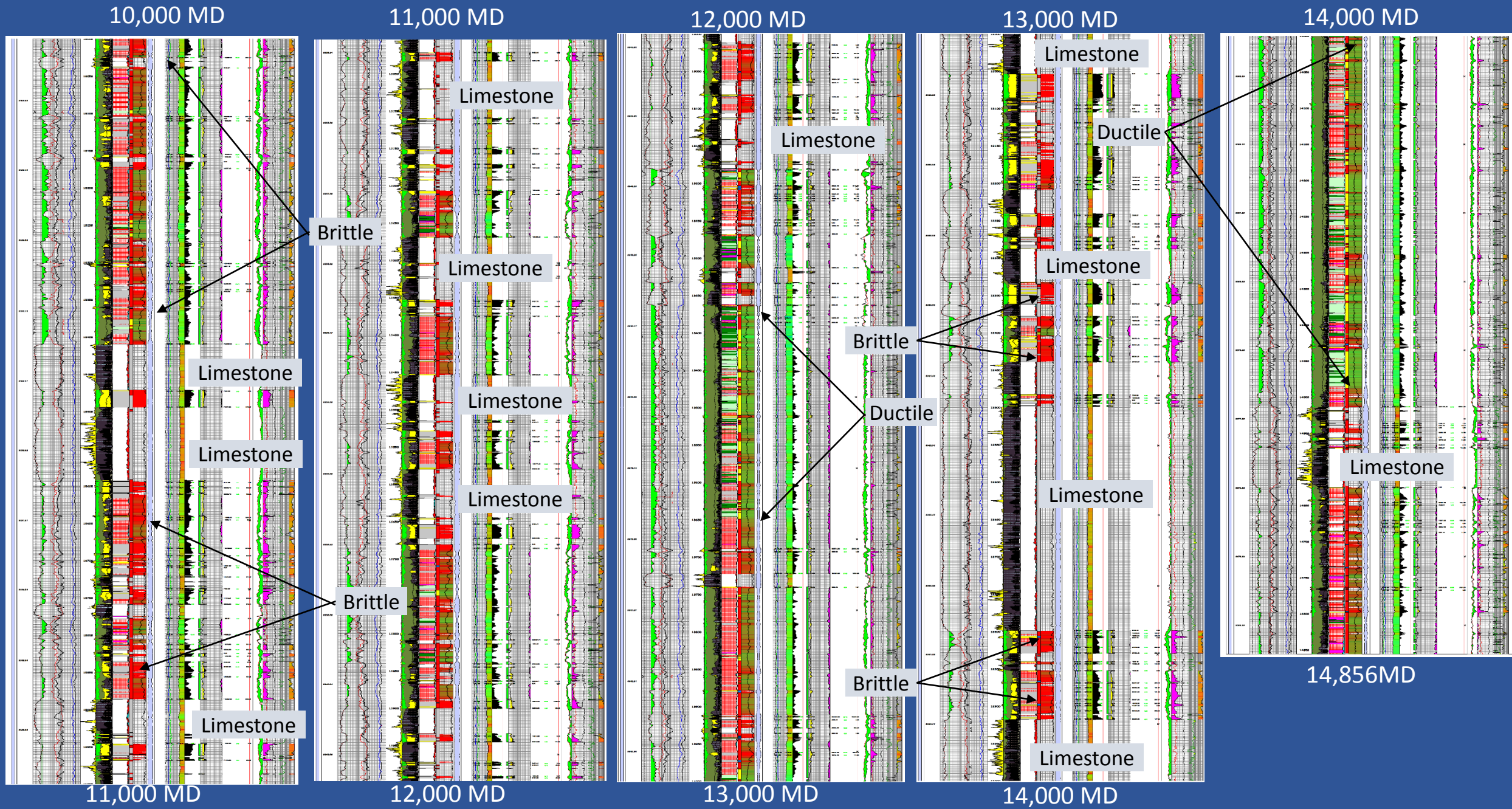
Wolfcamp A Bench
(Upper 150 feet)
Average Shale Sw Isopach



Optimizing Completions

- ❑ Run a pulsed neutron log within pipe and calibrate with a nearby suite of open-hole logs to create a shale log in the horizontal leg.
- ❑ Incorporating the mud log within the shale log provides complementary data on lithology, shows and gas.
- ❑ Considerable variation in lithology, brittleness, Poisson's ratio, shale porosity and organics usually occur along the horizontal leg.
- ❑ Allows for optimization of perf-clusters based on lithology, brittleness, Poisson's ratio and organics rather than a geometric design.
- ❑ Stage Width
- ❑ Nano-Surfactants

Example Shale Log In Horizontal Leg



Example Shale Log In Horizontal Leg



Other Tools

- ☐ Acquire a 2D seismic line along planned track
- ☐ Drill pilot holes when necessary
- ☐ Take rotary sidewall cores in pilot holes
- ☐ Use geosteering to help stay in zone
- ☐ Acquire microseismic and tracer surveys in “science wells”

Entering A New Pricing Environment

Short Term/Long Term?

- ☐ Maintain Healthy Economics
- ☐ Over Time...Cost of Services Will Come Down
- ☐ Reduce Completion Costs
- ☐ Reduce Drilling Costs (4 Casing Strings to 3 Strings?)
- ☐ Opportunities

Midland, Texas...The Tall City

Scenery?

Hot

Dry Heat

Windy

Hardly Ever Rains

Don't Want to be here
when it does!

