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

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.
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.
First Half of 2008:
• Venezuela Cut Off Sales to ExxonMobil...
• Nigerian Workers Went on Strike...
• Nigerian Protestors Blew Up a Chevron Pipeline...
• Nigerian Militants Caused Shell to Shut In 225MBOPD

Second Half of 2008:
• Demand For Oil Dropped Sharply
• Decline In World Economies...
• Low Price Expectations...

Between 2004 and 2008:
• First Significant Decrease in Non-Opec Supplies...
• Surging World Demand...
• World Demand Lower...
• USA Now World’s Largest Producer...
• Saudis not willing to sacrifice market share...
• Low Price Expectations...
Who is Tall City Exploration?
# Management Team Biographies

<table>
<thead>
<tr>
<th>Name/Title</th>
<th>Yrs Exp.</th>
<th>Professional Biography</th>
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| **Mike Oestmann**  
Chief Executive Officer | 31       | • Worked 15 years with Exxon, 7 years with Titan/Pure Resources/Unocal, 2 years with Celerio/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**  
President                   | 41       | • 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**  
Chief Financial Officer    | 15       | • 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**  
Vice President – Res. Eng. | 46       | • 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**  
Vice President - Drilling   | 32       | • 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**  
Vice President - Exploration | 44       | • 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**  
Vice President - Operations | 22       | • 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**  
Vice President – Land and Legal | 10       | • Began her legal career at Cotton, Blakeso, 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
Hammer-Rock Tank Area

Spraberry/Wolfcamp Shale
- 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.
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...
The Wolfcamp "A" and Leonard Pay Zones. The Wolfcamp "A" is considered a brittle zone. The Leonard Pay Zone has only slight gas or pay shown on the area mud logs. They are both shale zones and generally have a brittle behavior.

The Wolfcamp "B" has a more moderate to high pressure and the shales tend to be more gas productive. The Wolfcamp "C" zone has slight gas or pay shown on the area mud logs.
Initial Well Drilled By The TCE-ELE-Team Was 68 Miles From A Horizontal Wolfcamp Well

TCE Clara Good 10-15 1H 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 Benches)
Second Well ELE Hamlin 1522 3H 7/7/13

Initial Well ELE SFH 23 1H 2/7/13
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 (3rd Second Well/ELE)
- Hamlin 1522 3H 7/7/13
- Initial Well ELE SFH 23 1H 2/7/13
TCE Clara Good 10-15 1'H 2-mile lateral

Producing 750 BOPD

Proving 650 BOPD

68 Miles

Wolfcamp Well -

Team Was 68 Miles

8/28/13

30-20 8/13

20-29 2H

622 3H  7/7/13

2/7/13
Finding the “Sweet Spots”

Determine Amount of Pay

- Brittleness
- Kerogen Content
- Total Organic Content (Source Rock ≥ 0.5%, Shale Reservoir ≥ 2%)
- Shale Porosity
- Shale Permeability
- Shale Mineralogy
- Pay “Tells”
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 $R_t \geq 25 \Omega m$

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

Characteristic Upper WFMP A "Resistivity Bloom"

Using a Resistivity Log to Net Shale-Pay
Example Isopach
Wolfcamp A Bench
Net Feet Shale Pay
\( \text{Rt} \geq 25 \text{ Ohms} \)

- 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**

- **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 A**

**WFMP B**

**Shale Porosity**

**Comcomputed “Shale Log”**

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

- Net-Feet of total organic content (TOC) ≥ 2% *(Source Rock ≥ 0.5%’ Shale Reservoir ≥ 2%)*,
- Net-Feet of kerogen ≥ 2% *(Arbitrary hy-grade)*,
- Net-Feet of shale-porosity ≥ 2% *(Pure shale has almost no porosity.)*,
- Net-Feet of Brittleness ≥ 35% *(Arbitrary hy-grade)*,
- Ratio Britt > 35%/Britt < 35%,
- AVG Shale Sw.
Wolfcamp A B Bench
Net Feet Pay Isopach
\[ \text{TOC} \geq 2\% \]
Wolfcamp A & B Benches
Net Feet Pay Isopach
Kerogen ≥ 2%
Wolfcamp A & B Benches
Net Feet Pay Isopach
Shale Porosity ≥ 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 ≥ 35% / Shale Brittleness <35%

Mapping With Shale Log Attributes
Wolfcamp A Bench
(Upper 150 feet)
Average Shale Sw Isopach
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
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!