Valuing Undeveloped Minerals

In Active Shale Plays

Joel S. Castello, P.E.
Questions

• “I just received an offer of 1,000 months of current income....Do you think I should sell?”

• “I have an offer to purchase my royalty interest in Martin Co., can you beat it?”

• “I need you to evaluate these Midland Co. royalties for Estate Tax purposes, and I need a true Fair Market Value Appraisal.”

• “I am gifting some minerals to my children, and I need a realistic Fair Market Value Appraisal.”
Fair Market Value Appraisal

- Midland Basin
  - Nine HZ wells Waiting on Completion
  - Sixteen Vertical wells PDP
- No horizontal direct offsets
- Proved Value = $60,000
- Total FMV = $1,100,000
Time Value of Money

- Cold hard cash is precious...”opportunity” TVM
- Your money can be tied up in an illiquid asset for many years
- Shale plays are huge.
  - Pioneer inventory: 40+ years
  - Endeavor inventory: 40+ years
- Non producing minerals have no loan value
- Tank or Cube drilling means delays in acreage development
- Next to well performance, TIME is your biggest value driver
What is a Royalty Acre?

- A royalty acre is an industry defined term
- One mineral acre leased at 1/8 royalty
- Example
  - 100 net mineral acres leased at 1/4 royalty equals 200 net royalty acres (NRA)
  - 3/16 royalty equates to 150 NRA
- Equate an ORRI to an equivalent NRA
  - 1% ORRI in 640 acres equates to 51.2 NRA
  - $51.2/640 \times 0.125 = .01$
- Compare similar buy/sell transactions in the area
Location, Location, Location

- Core vs. edge areas
- Number of proven shale benches
- Thermal maturity
- Gassy or oily
- Best in class operator standing
- Likelihood of acreage being pooled
- Focus area by operator
- Analogous data availability
- Are wells economic to the working interest
Data Analytics

- Lateral lengths and perforated intervals
- Normalize data to anticipated new well drilling lengths
- Well vintage...Pre 2016 +/- performance < Current performance
- Shale zones perform differently in many cases
  - Spraberry vs. Wolfcamp
  - Bone Springs vs. Wolfcamp
  - Woodford vs. Springer
  - Pressure differences
  - Steeply dipping beds, shallow dead oil to deep dry gas
- Parent-Child performance degradation
Actual Deal Offering

- Loving County, Pecos River area, near Reeves/Lea corners
- One PDP HZ well
- No new well permits
- 0.02 ORRI in one section HBP by one older WC HZ well
- 102.4 NRA equivalent
- Have offer of $1.43 MM ($14,000/NRA), can you beat it?
- PDP PV 10 value = $2,000 per NRA (Ask= 7 X PDP value)
Investor Presentation Data

- Find nearby public company
- Review technical data
- BS, X-Y, WC A, WC B bench development
- Tight spacing based on core and micro seismic data
- Most likely 20 + wells per section ultimate density
- Cum oil vs. Time graph
- Recent well results
Real-Time Analytics Driving Well Design

PECOS STATE MONITORING PROJECT

PILOT/MONITOR WELL

- Contiguous 806’ core running from 3rd Bone Spring through Wolfcamp B
- Equipped with Microseismic geophones, permanent external pressure & temperature gauges
- Strategically placed to monitor fracs during completion, overall well performance and depletion through life of the well

PERMANENT DAS-DTS FIBEROPTIC INSTALLATION

- Successfully installed in the Pecos State 39-2H well and completed all frac stages without damaging the fiber

BENEFITS

- Optimize well spacing and landing targets
- Improve completion design
- Develop best practices for choke and flow management
- Optimize artificial lift

PECOS 39 PILOT 1

WELL LAYOUT

FIBEROPTIC CABLE

MICROSEISMIC

39-1H C-3H 39-2H D-4H A-1H B-2H C-3H B-2H 39-2H D-4H A-1H B-2H C-3H B-2H

PECOS 39 PILOT 1
Building Operational Momentum in Stateline

THIRD BON ESPRING UPDATE

- CBR 11-2 1H
  - 2-MILE LATERAL
  - 60-DAY AVG: 2,955 BOE/D (52% OIL)
- CBR 9-4-13H
  - 2-MILE LATERAL
  - PRODUCED ~44,000 BOE (54% OIL) AFTER 23 DAYS

- 3rd BS INCREASING TIER 1 INVENTORY
- UPCOMING STATELINE SPACING TEST IN 3rd BS
- 3rd BS INCLUDED IN FUTURE DEVELOPMENT

DELWARE 3Q HIGHLIGHTS

- LINDSAY 10-3B-2H (X/Y)
  - 90-DAY AVG: 3,141 BOE/D (54% OIL)
- LINDSAY 10-3G-7H (UPPER WC A)
  - 60-DAY AVG: 3,575 BOE/D (53% OIL)

- FIRST 200 MMCF/D TRAIN COMPLETED IN SEPTEMBER
- SECOND 200 MMCF/D TO BE COMPLETED MID-2019
- 3rd QUARTER AVERAGE REALIZED OIL PRICE 98% WTI1
  - $1.59 OFF WTI INCLUDING MIDLAND BASIS SWAPS

1 Includes the impact of Midland basis swaps.
Net Midland Basin Location by Zone / Lateral (1)

<table>
<thead>
<tr>
<th>Zone</th>
<th>5,000'+</th>
<th>7,500'+</th>
<th>10,000'+</th>
<th>Total</th>
<th>Avg. Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>184</td>
<td>229</td>
<td>289</td>
<td>702</td>
<td>7,500'</td>
</tr>
<tr>
<td>LS</td>
<td>252</td>
<td>302</td>
<td>352</td>
<td>906</td>
<td>7,400'</td>
</tr>
<tr>
<td>WCA</td>
<td>193</td>
<td>246</td>
<td>307</td>
<td>746</td>
<td>7,500'</td>
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<tr>
<td>WCB</td>
<td>175</td>
<td>246</td>
<td>311</td>
<td>732</td>
<td>7,600'</td>
</tr>
<tr>
<td>Other</td>
<td>438</td>
<td>356</td>
<td>450</td>
<td>1,245</td>
<td>7,200'</td>
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<tr>
<td><strong>Total</strong></td>
<td>1,243</td>
<td>1,379</td>
<td>1,709</td>
<td>4,330</td>
<td><strong>7,400'</strong></td>
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Midland Basin Premium Zone Spacing Assumptions vs. Peers (2)

<table>
<thead>
<tr>
<th>Zone</th>
<th>FANG</th>
<th>Peer1</th>
<th>Peer1</th>
<th>Peer2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolfcamp B</td>
<td>28</td>
<td>33</td>
<td>34</td>
<td>38</td>
</tr>
<tr>
<td>Wolfcamp A</td>
<td>351</td>
<td>425</td>
<td>430</td>
<td>435</td>
</tr>
<tr>
<td>Lower Spraberry</td>
<td>288</td>
<td>322</td>
<td>325</td>
<td>330</td>
</tr>
<tr>
<td>Middle Spraberry</td>
<td>285</td>
<td>320</td>
<td>323</td>
<td>328</td>
</tr>
<tr>
<td><strong>TOTAL wells/section</strong></td>
<td>289</td>
<td>338</td>
<td>348</td>
<td>358</td>
</tr>
</tbody>
</table>

Conservative spacing assumptions and depth of Tier One, long lateral inventory to drive capital efficient growth

Net Delaware Basin Locations by Zone / Lateral (1)

<table>
<thead>
<tr>
<th>Zone</th>
<th>5,000'+</th>
<th>7,500'+</th>
<th>10,000'+</th>
<th>Total</th>
<th>Avg. Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>2BS</td>
<td>141</td>
<td>96</td>
<td>115</td>
<td>353</td>
<td>7,200'</td>
</tr>
<tr>
<td>3BS</td>
<td>357</td>
<td>203</td>
<td>247</td>
<td>806</td>
<td>7,000'</td>
</tr>
<tr>
<td>WCA</td>
<td>302</td>
<td>229</td>
<td>248</td>
<td>779</td>
<td>7,200'</td>
</tr>
<tr>
<td>WCB</td>
<td>229</td>
<td>215</td>
<td>242</td>
<td>686</td>
<td>7,400'</td>
</tr>
<tr>
<td>Other</td>
<td>305</td>
<td>208</td>
<td>167</td>
<td>680</td>
<td>6,700'</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,334</td>
<td>951</td>
<td>1,018</td>
<td>3,303</td>
<td><strong>7,100'</strong></td>
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Delaware Basin Premium Zone Spacing Assumptions vs. Peers (2)

<table>
<thead>
<tr>
<th>Zone</th>
<th>FANG</th>
<th>Peer1</th>
<th>Peer1</th>
<th>Peer2</th>
<th>Peer3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wolfcamp B</td>
<td>20</td>
<td>27</td>
<td>24</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Wolfcamp A</td>
<td>29</td>
<td>33</td>
<td>35</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Upper Wolfcamp A</td>
<td>25</td>
<td>30</td>
<td>32</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Lower Wolfcamp A</td>
<td>22</td>
<td>27</td>
<td>30</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL wells/section</strong></td>
<td>20</td>
<td>27</td>
<td>24</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>
Type Curve Preparation

- Wolfcamp and Bone Springs offset development
  - Wolfcamp
    - Ten wells
    - Lateral lengths 1, 1.5, 2.0 miles
    - Vintages < 1 year, 1-2 years, 2 + years
  - Bone Springs
    - Three wells
  - Normalize data based on lateral lengths
  - Build Type Curve (IP 30, 1-YR, 2-YR Rates)
  - Run PV 10 DCF on one well, one NRA (PV 10 per well per NRA)
Value Assessment

- Start Date 1/1/2021
- IP 30 = 700 BOPD/4,300 MCFD, YR ONE = 200 BOPD/1,300 MCFD
- $50 oil, $3.00 gas
- 0.000195 NRI (1 NMA X 0.125 / 640 AC)
- PV 10 = $3,300 per NRA
- $14,000 less $2,000 PDP value = $12,000 per NRA
- So, I would have to prepay for ~4 future wells to be competitive
Business Decision

- How many wells should I prepay for?
- How far should I stretch, how much do I want to part with my cold hard cash?
- Do I really believe in the ultimate well density?
- Can acreage be pooled or traded in a reasonable timeframe?
- How likely is the operator to drill up the acreage?
- How long will it take to drill up the acreage?
  - Industry shift to “Up Spacing”
  - Operators must live within cash flow
## SANITY CHECK!

### Viper Energy Partners 2018 Acquisitions

<table>
<thead>
<tr>
<th>County</th>
<th>Operator</th>
<th>Size ($ MM)</th>
<th>Price per NRA</th>
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<tbody>
<tr>
<td>Eddy</td>
<td>Marathon</td>
<td>$ 21</td>
<td>$ 14,500</td>
</tr>
<tr>
<td>Loving, Reeves, Lea</td>
<td>Various</td>
<td>$ 36</td>
<td>$ 20,200</td>
</tr>
<tr>
<td>Midland, Glasscock</td>
<td>Various</td>
<td>$ 23</td>
<td>$ 16,300</td>
</tr>
<tr>
<td>Reeves, Ward</td>
<td>Noble</td>
<td>$ 15</td>
<td>$ 12,100</td>
</tr>
<tr>
<td>Loving, Reeves, M/M</td>
<td>Various</td>
<td>$ 150</td>
<td>$ 14,200</td>
</tr>
</tbody>
</table>

**Average** $ 15,460
Why Invest in Minerals?

Upside:

If we are right and well density is 20, then with development over the next 3-4 years, and at a purchase price of $ 14,000 per NRA, the IRR = 50 %, ROI = 10:1

Downside:

Limited except for TIME if we stay in core area
THAT’S ALL FOLKS!

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