Presentation Outline

• Current oil transportation dynamics
  • Understanding current and future oil production
    – Pricing update
    – Activity
    – Oil forecasts
  • North Dakota natural gas production
    – Flaring and gas capture
    – Natural gas liquids
• Pipeline construction update
• Refrac economics
Estimated Williston Basin Oil Transportation

- Pipeline Export: 77%
- Refined: 7%
- Truck to Canadian Pipelines: 10%
- Estimated Rail: 6%

August 2017
Rail Destinations Market Share (July 2017)

Data for Rail Destination Market Share Provided by the US Energy Information Administration

JJ Kringstad - North Dakota Pipeline Authority
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North Dakota Impact of Smaller Discount

- 2016 Weighted Average Discount: $7.71
- June/July/August 2017 Wt. Average Discount: $5.61
- $2.10/BBL Improvement Post DAPL Commercial In-Service

- 96,148,772 Taxable Barrels In June/July/August 2017
- Wt. Avg. Tax Rate in June/July/August 2017: 9.74%

Three Month Revenue Impact
9.74% x 96,148,772 x $2.10 =

$19,666,269 Additional State Revenue When Compared to Avg. 2016 Discount (~$6+ Million Per Month)

Does Not Include Royalty Owner and Industry Revenue Impact
Statewide Oil Performance

Average BKN/TF Well Performance Statewide (Minimum 1 bopd)
Statewide Gas Performance

Average BKN/TF Well Performance Statewide (Minimum 1 bopd)
North Dakota Oil Production Forecast

ND Oil Production, BOPD

- NDPA Oil Forecast: Case 1
- NDPA Oil Forecast: Case 2
North Dakota Forecast Activity Assumptions

The graph shows the number of new wells added per month from 2009 to 2035. The red line represents ND New Wells Case 1, and the gray line represents ND New Wells Case 2. The NDPA Forecast is indicated for reference.

- ND New Wells Case 1: Shows a consistent increase from 2019 to 2029, after which it remains stable.
- ND New Wells Case 2: Starts lower than Case 1 and reaches a similar level by 2029, then stabilizes.

The graph highlights the assumption of future activity levels in North Dakota's oil and gas industry.
Williston Basin Oil Production & Export Capacity, BOPD

Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.
TransCanada: Energy East Canceled

- Proposed Upland Pipeline Connection to Williston Basin
- Successful Open Season During 2014
- Initial Capacity 220,000 BOPD (Expandable to 300,000 BOPD)
- Target In-service Date: 2020
- Energy East Project Capacity 1.1 MMBOPD
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NDPA ND Gas Production Forecast

Natural Gas Production, MMCFD

- ND Gas Case 1 - MMCFD
- ND Gas Case 2 - MMCFD

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Solving the Flaring Challenge

- **GREEN** – % of gas captured and sold
- **Blue** – % flared from zero sales wells
- **Orange** – % flared from wells with at least one mcf sold.

### Simple Terms

- **Blue** – Lack of pipelines
- **Orange** – Challenges on existing infrastructure

Aug 2017 Data – Non-Confidential Wells
Solving the Flaring Challenge

Total ND Gas Flaring Percent (Color Indicates Reason)

- Orange: Flaring % From Wells Connected to Sales
- Blue: Flaring % From Wells Not Connected to Sales
- Gray: Total ND Gas Production

ND Gas Production, MMCFD


2500
2000
1500
1000
500
0
40%
35%
30%
25%
20%
15%
10%
5%
0%

JJ Kringstad - North Dakota Pipeline Authority
Major Gas Pipeline and Processing Infrastructure
North Dakota Captured* NGL’s

*Non-flared NGL’s & Assumes 10 GPM
NGL Takeaway Options Are Limited

Barrels Per Day

Northern Border (70 mbpd)
Aux Sable Prairie Rose
Alliance Tioga Lateral
Purity Truck/Rail & Rail
Case 1: All Captured NGLs

WBI Transmission
ONEOK Bakken NGL
Vantage
Northern Border Canadian NGLs
Case 2: All Captured NGLs
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• **Pipeline construction update**
• Refrac economics
North Dakota Pipeline Construction

- New Miles
- Year End Miles

Sources: NDIC & PHMSA

<table>
<thead>
<tr>
<th>Year</th>
<th>New Miles</th>
<th>Year End Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>673</td>
<td></td>
</tr>
<tr>
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<tr>
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<td>2,178</td>
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</tr>
<tr>
<td>2016</td>
<td>914</td>
<td>26,353</td>
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</tbody>
</table>

Total Miles of Pipe
North Dakota Pipeline Construction

Sources: NDIC & PHMSA

Gathering

<table>
<thead>
<tr>
<th>Year</th>
<th>Gas Gathering</th>
<th>Oil Gathering</th>
<th>Produced Water</th>
<th>Total</th>
<th>Total</th>
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<td>379</td>
<td>313</td>
<td>248</td>
<td>917</td>
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<tr>
<td>2012</td>
<td>965</td>
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<td>2014</td>
<td>538</td>
<td>302</td>
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<tr>
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<td>547</td>
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<td>2016</td>
<td>136</td>
<td>180</td>
<td>192</td>
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Transmission

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<tr>
<th>Year</th>
<th>Gas Transmission</th>
<th>Petroleum Transmission</th>
<th>Total</th>
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<td>143</td>
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<tr>
<td>2012</td>
<td>202</td>
<td>202</td>
<td>404</td>
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<tr>
<td>2013</td>
<td>577</td>
<td>577</td>
<td>1,154</td>
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<td>2014</td>
<td>39</td>
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<td>2015</td>
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<td>302</td>
<td>604</td>
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<tr>
<td>2016</td>
<td>403</td>
<td>403</td>
<td>806</td>
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Sources: NDIC & PHMSA
New Miles and Well Completions

<table>
<thead>
<tr>
<th>Year</th>
<th>New Miles of Pipe</th>
<th>Well Completions</th>
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</thead>
<tbody>
<tr>
<td>2008</td>
<td>673</td>
<td>539</td>
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<tr>
<td>2009</td>
<td>1,355</td>
<td>499</td>
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<tr>
<td>2012</td>
<td>3,184</td>
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<td>2013</td>
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<td>2,094</td>
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<tr>
<td>2014</td>
<td>2,179</td>
<td>2,288</td>
</tr>
<tr>
<td>2015</td>
<td>2,178</td>
<td>1,539</td>
</tr>
<tr>
<td>2016</td>
<td>914</td>
<td>738</td>
</tr>
</tbody>
</table>
2008
6,262 mi²

2009
6,493 mi²

2010
9,866 mi²

2011
13,735 mi²

2012
16,267 mi²

2013
13,428 mi²

2014
12,053 mi²

2015
8,433 mi²

2016
4,206 mi²

2017 YTD
3,578 mi²

2 Mile Buffer Around New Wells By Year

Background Map: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
New Miles and Activity Footprint

New Miles of Pipe

<table>
<thead>
<tr>
<th>Year</th>
<th>Square Miles</th>
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<tr>
<td>2008</td>
<td>6,262</td>
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<td>2009</td>
<td>6,493</td>
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<tr>
<td>2010</td>
<td>9,866</td>
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<tr>
<td>2011</td>
<td>13,735</td>
</tr>
<tr>
<td>2012</td>
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<td>2013</td>
<td>13,428</td>
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<td>2014</td>
<td>12,053</td>
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<td>2015</td>
<td>8,433</td>
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<td>2016</td>
<td>4,206</td>
</tr>
<tr>
<td>2017</td>
<td>3,578</td>
</tr>
</tbody>
</table>

*2017 Forecasted
Predicting New Miles With Activity Footprint
Evolution of Oil Gathering in ND
Statewide Totals

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Piped, BOPD</th>
<th>Estimated Trucked, BOPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>263,352</td>
<td>465,966</td>
</tr>
<tr>
<td>2013</td>
<td>410,829</td>
<td>524,649</td>
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<tr>
<td>2015</td>
<td>725,743</td>
<td>441,644</td>
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<tr>
<td>2016</td>
<td>718,177</td>
<td>281,372</td>
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<tr>
<td>2017</td>
<td>725,512</td>
<td>285,231</td>
</tr>
</tbody>
</table>
Evolution of Oil Gathering in ND

Estimated Piped, BOPD

BBN

Estimated Trucked, BOPD

BBN

JJ Kringstad - North Dakota Pipeline Authority
Solving the Flaring Challenge

- **Suspended Capacity**
- **Existing Plant Capacity**
- **NDPA Case 1 Forecast**
- **NDPA Case 2 Forecast**
- **Historical Sold, MMCFD**
- **Historical Flared, MMCFD**

- Targets Case 1 (Sold)
- Targets Case 1 (Flared)

- 91-93% Q4-20
- 88% Q4-18
- 85% Q4-16
- 80% Q2-16
- 77% Q1-15
- 74% Q4-14

J.J. Kringstad - North Dakota Pipeline Authority
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Bakken Refracs

Updated From Previous Refrac Work

185 Wells, Up From 142
List Cleaned Up With DMR Assistance
Refracs In the Bakken*

<table>
<thead>
<tr>
<th>Avg. Years from IP to Refrac</th>
<th>Number of Wells</th>
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</thead>
<tbody>
<tr>
<td>BILLINGS</td>
<td>1</td>
</tr>
<tr>
<td>BURKE</td>
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<tr>
<td>DIVIDE</td>
<td>4</td>
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<tr>
<td>DUNN</td>
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<tr>
<td>MCKENZIE</td>
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<tr>
<td>MOUNTAIL</td>
<td>36</td>
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<tr>
<td>WILLIAMS</td>
<td>17</td>
</tr>
</tbody>
</table>

*While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.
Refrac Completion Year*

*While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.
Example: Pre/Post Refrac Oil

BOPD

Production Month

Max BOPD2

Avg BOPD
Example: Pre/Post Refrac Oil

BOPD

Production Month

Avg. BOPD

Max BOPD

0 100 200 300 400 500 600 700

0 100 200 300 400 500 600 700

-5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
Performance Pre/Post Refrac
## Performance Pre/Post Refrac

<table>
<thead>
<tr>
<th>State</th>
<th>Avg. Max Original Completion</th>
<th>Avg. Max Recompletion</th>
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<tbody>
<tr>
<td>BILLINGS</td>
<td></td>
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<tr>
<td>BURKE</td>
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<td>MCKENZIE</td>
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<tr>
<td>WILLIAMS</td>
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</tr>
</tbody>
</table>

MCFD
Example: 257,000 BBLS of Incremental Production

Incremental Production (Refrac)
Original Decline
Original Production

BOPD

Production Month

1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153 161 169 177 185 193
Refrac Economics Methodology

Incremental Production Above Original Well Decline Profile

Assumes Refrac Decline Curve Profile Matches Original Well
Refrac Summary of $45 Wellhead Oil

Incremental Oil, BBL / Refrac Cost ($ Million)

<table>
<thead>
<tr>
<th>After Tax IRR</th>
<th>100,000</th>
<th>200,000</th>
<th>300,000</th>
<th>400,000</th>
<th>500,000</th>
<th>600,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2 MM</td>
<td>$3 MM</td>
<td>$4 MM</td>
<td>$5 MM</td>
<td>$2 MM</td>
<td>$3 MM</td>
<td>$4 MM</td>
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<tr>
<td>$2 MM</td>
<td>$3 MM</td>
<td>$4 MM</td>
<td>$5 MM</td>
<td>$2 MM</td>
<td>$3 MM</td>
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<td>$2 MM</td>
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<td>$4 MM</td>
<td>$5 MM</td>
<td>$2 MM</td>
<td>$3 MM</td>
<td>$4 MM</td>
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</tbody>
</table>

Assumed Range of Minimum Acceptable Rate of Return

0% to 300%
Refrac Breakeven Summary

Incremental Oil, BBL / Refrac Cost ($ Million)

Refrac Wellhead Price (AT IRR of 20%)
Contact Information

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North Dakota Pipeline Authority

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www.pipeline.nd.gov
www.northdakotapipelines.com