Unlocking the Treasure of the Alberta Montney
Montney Fun Facts

- Exploration focus for dozens of companies
  - over 50 companies actively playing Montney
  - About half of these are pure-play Montney
- Significant capital invested to date
  - at least $3B spent acquiring Crown mineral rights in the unconventional fairway
- Over 8,400 horizontal wells drilled since 2007
  - at $5MM to $10MM DCET per well gives total capital spend of $42B to $84B on wells alone!
- Of the 135 active rigs in Western Canada, 46 are drilling Montney
- Over 6,000 horizontal Montney wells are producing 7.6 Bcf/d and 195 Mbbl/d liquids
  - the Montney alone accounts for >39% of total Western Canada raw gas production

Source: geoSCOUT, GeoEDGES, BMO Capital Markets
The Big Picture – Resource Wise

Generalized Lithology\(^{(3)}\)

- In-Place resource estimate of 4,274 Tcf gas and 268.4 Bbbl oil and NGLs\(^{(4)}\)
- Unconventional play area is roughly ~480 km by 70 km; 34,000 km\(^2\)
- Montney thickness (unconventional areas) between 200 and 300+ metres (Calgary Tower is 191 m tall, Suncor is 215 m, The Bow is 236 m and Brookfield Place is 247 m tall!)

Depositional Schematic\(^{(5)}\)

Source: geoSCOUT, GeoEDGES, BMO Capital Markets
Thick and Pervasively Charged from End to End\(^{(6)}\)

- Original Montney development (apart from the subcrop play) was in vertical gas wells targeting the deep, high porosity turbidite scour and fan deposits in the Pouce Coupe, Valhalla and La Glace areas.
- By 2007 and 2008, operators were having great success placing horizontals into the tighter siltstones in and around these legacy fields, beginning a boom in unconventional development.
- Today, operators are stacking horizontals into the Montney, four or five benches isn’t uncommon.

Source: geoSCOUT, GeoEDGES, BMO Capital Markets
Montney Land Grab - Riding the Wave

Crown Sale Activity by Year

Sections Sold at Crown Sales by Area

<table>
<thead>
<tr>
<th>Year</th>
<th>Sections Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>755</td>
</tr>
<tr>
<td>2008</td>
<td>1,377</td>
</tr>
<tr>
<td>2009</td>
<td>1,336</td>
</tr>
<tr>
<td>2010</td>
<td>3,489</td>
</tr>
<tr>
<td>2011</td>
<td>2,364</td>
</tr>
<tr>
<td>2012</td>
<td>1,283</td>
</tr>
<tr>
<td>2013</td>
<td>1,164</td>
</tr>
<tr>
<td>2014</td>
<td>1,263</td>
</tr>
<tr>
<td>2015</td>
<td>1,507</td>
</tr>
<tr>
<td>2016</td>
<td>1,408</td>
</tr>
<tr>
<td>2017</td>
<td>1,219</td>
</tr>
<tr>
<td>2018</td>
<td>1,815</td>
</tr>
<tr>
<td>2019 ytd</td>
<td>76</td>
</tr>
</tbody>
</table>

Source: geoSCOUT, BMO Capital Markets
Development of the Unconventional Montney Play

Horizontal Wells RR’d 2007 - 2018

- 1,650 since 2007
  - 8 rigs running\(^{(1)}\)

- 2,640 since 2007
  - 7 rigs running\(^{(1)}\)

- 1,400 since 2007
  - 25 rigs running\(^{(1)}\)

- 670 since 2007
  - 1 rig running\(^{(1)}\)

- 830 since 2007
  - 4 rigs running\(^{(1)}\)

- 1,130 since 2007
  - 1 rig running\(^{(1)}\)

Horizontal Production (Bcfe/d)

- 2.06 Bcfe/d from 1,000 wells in the Focus Area (Dec 2018 cal day)

- 1,177 since 2007
- 786 since 2007
- 592 since 2007
- 1,164 since 2007
- 932 since 2007

Horizontal Wells Rig Released

- Source: geoSCOUT, BMO Capital Markets

- Biggest Growth Area
  - 32% of 2018 horizontal wells were RR’d in the Focus Area

\(^{(1)}\) Source: geoSCOUT, BMO Capital Markets
Alberta Montney Focus: A Spectrum of Thermal and Play Maturity

Generalized Montney Thermal Maturity

All areas show favourable economics which is why the Alberta Montney is garnering its fair share of capital commitment leading to delineation in the understanding of the extent and types of hydrocarbons in this region.

Source: geoSCOUT, BMO Capital Markets
Alberta Montney Focus: Who plays in this Sandbox?

Many Pure-Play Operators
Large and Contiguous Acreage Footprints
Land situation is very dynamic
Ongoing consolidation and expansion
Very active area, currently 25 rigs running

Top Operators by Well Count\(^{(1)}\)(\(^{(7)}\))

<table>
<thead>
<tr>
<th>Operator</th>
<th>Well Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipestone</td>
<td>8</td>
</tr>
<tr>
<td>NuVista</td>
<td>4</td>
</tr>
<tr>
<td>Encana</td>
<td>2</td>
</tr>
<tr>
<td>Hammerhead</td>
<td>2</td>
</tr>
<tr>
<td>Paramount</td>
<td>2</td>
</tr>
<tr>
<td>Pipestone Oil</td>
<td>1</td>
</tr>
<tr>
<td>Canadian Natural</td>
<td>1</td>
</tr>
<tr>
<td>Orlen</td>
<td>1</td>
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<tr>
<td>Shell</td>
<td>1</td>
</tr>
<tr>
<td>Velvet</td>
<td>1</td>
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<tr>
<td>XTO</td>
<td>1</td>
</tr>
<tr>
<td>Sinopec</td>
<td>1</td>
</tr>
<tr>
<td>Strath</td>
<td>1</td>
</tr>
<tr>
<td>Cequence</td>
<td>1</td>
</tr>
<tr>
<td>Husky</td>
<td>1</td>
</tr>
<tr>
<td>Inception</td>
<td>1</td>
</tr>
<tr>
<td>Kelt</td>
<td>2</td>
</tr>
<tr>
<td>Kicking Horse</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: geoSCOUT, BMO Capital Markets, Land from corporate presentations, press releases and public sources
Delineating and Derisking the Play

Current Situation as of end Feb 2019

Continues to attract significant capital:

- double the production in the last three years,
- 50 wells already drilled in 2019 and existing permits for 355 more!

79% of current Alberta Montney well licenses and 65% of Alberta Montney wells spud since Jan 2018 are focused in this area of Alberta.

Source: geoSCOUT, BMO Capital Markets
Improved Completion Methods Optimize Deliverability

Lateral Length (m)

Longer Lateral Length
Average completed lateral lengths have increased by almost 900 m; Top longest completed lengths ~5,000 m

Source: geoSCOUT, BMO Capital Markets, Verdazo Analytics, geoLOGIC Well Completions & Frac Database, Company Corporate Presentations
Improved Completion Methods Optimize Deliverability

Frac Spacing (m)

Tighter Frac Spacing

Frac spacing has significantly decreased from an average of 105 m to 55 m resulting in increased number of stages from <15 to >60

Source: geoSCOUT, BMO Capital Markets, Verdazo Analytics, geoLOGIC Well Completions & Frac Database, Company Corporate Presentations
Increased Proppant Placed
In every area except Gold Creek, proppant tonnage has significantly increased from an average of ~800 t to >8,000 t
Improved Efficiencies Result in Reduced Well Costs

Drill & Completion Costs Normalized per 100 m LL ($M)

Decreased Drill and Completion Well Costs

Drill costs have reduced by 64% and completion costs have reduced by 42% since 2012

Source: geoSCOUT, BMO Capital Markets, Verdazo Analytics, geoLOGIC Well Completions & Frac Database, Company Corporate Presentations
Highlighted Recent Successes

Encana reported yields (bbl/MMcf)
- Volatile Oil >250
- Very Rich CND 150-250
- Rich Gas CND 50-150

NuVista (Pipestone) Drilling 8-well Hi-Fi Pad and piloting 4 layer ‘Cube’
Northwest Pad restricted IP$_{365}$ 2.2 MMcf/d CGR 185 bbl/MMcf

Pipestone and Blackbird Merge
Strong initial test results up to 3,100 boe/d and CGR to 300 bbl/MMcf
Drill 11 wells in 2019 (3 drilled)

NuVista (Elmworth) Hi-Fi Type-Curve
7.0 MMcf/d CGR 40 bbl/MMcf

NuVista (Gold Creek)
IP$_{30}$ 5.0 MMcf/d CGR 81 bbl/MMcf
2/05-27-068-07W6 Cdn well record longest lateral MD 7,848 m LL 5,049 m
IP$_{30}$ 10.4 MMcf/d

NuVista (Bilbo) Upper Montney
56-well average IP$_{30}$ 6 MMcf/d
CGR 124 bbl/MMcf
testing Lower Montney
IP$_{30}$ 3.6 CGR 182 bbl/MMcf

Seven Generations (Nest 2)
IP$_{30}$ 2.0 – 2.4 Mboe/d
CGR$_{365}$ 90 - 295 bbl/MMcf
06-12-063-05W6: Peak IP >20 MMcf/d

Kelt (Wembley) 6-wells RR in 2018
04-01-072-08W6 IP$_{30}$ 1.34 Mboe/d
(83% liquids)

Paramount (Wapiti)
Avg IP$_{365}$ 1,395 boe/d CGR 80 bbl/MMcf
All 3 intervals tested
Pad 9-3 Drilled 11 wells in 2018
12-well pad 5-3 planned in 2019

Velvet Stacked Horizontals
01-10-069-03W6 IP$_{120}$ 486 bbl/d oil and 1.3 MMcf/d gas

Hammerhead (Gold Creek)
Gen III TC IP$_{30}$ 1.5 Mboe/d

Hammerhead (Sweet Spot)
IP$_{30}$ of 20 wells
607 bbl/d and 4.9 MMcf/d

Paramount (Karr)
Avg IP$_{365}$ 961 boe/d CGR 173 bbl/MMcf
Drilled two 5-well pads in 2018
Lwr Mtny well results par with Middle

Hammerhead (Karr) Gen III TC
IP$_{30}$ 1.5 – 2.0 Mboe/d
EUR 1.2 – 1.4 MMboe (60-70% Liquids)
testing Lower Montney IP$_{30}$ 430 bbl/d

Seven Generations (Nest 1)
IP$_{30}$ 1.5 Mboe/d CGR$_{365}$ 478 bbl/MMcf

Seven Generations (Nest 3)
IP$_{30}$ 2 Mboe/d CGR$_{365}$ 55 bbl/MMcf

Source: geoSCOUT, BMO Capital Markets, Company Corporate Presentations
What to Watch For in the Alberta Montney...

Continued optimization of well design and production practice
• New generation well completions are showing extraordinary initial well results
• Multi-well pads result in reduced capital and increased recoveries (no parent-child impact)
• Reservoir management strategies to optimize long-term condensate performance (slow-back or extended soaking)

Continued delineation of the tight-oil fairway, and pushing the play eastward
• The high condensate ratios in the ultra-rich & volatile-oil fairways are the best in the basin
• Were the large Crown land blocks purchased last fall acquired for the Montney?

Lower Montney showing great promise
• Some of the first wells into the lower zones are showing higher than expected liquids
• Will the Lower Montney play double the locations of the Upper/Middle Montney?

Continued land consolidation and M&A activity
• 2018 asset transactions included Strath acquiring Paramount Resthaven block and NuVista acquiring Cenovus Pipestone block
• Corporate transactions included Velvet takeover of Iron Bridge and the strategic combination of Pipestone and Blackbird
• SemCAMS Midstream JV acquired Meritage Midstream
• What and who is next?

There is plenty more treasure to be discovered
Acknowledgments & Contributions:

BMO Capital Markets A&D Advisory Group
Publications: http://www.bmoaddeals.com

Questions?
Reference Material and Footnotes

Sources and References:

• geoSCOUT, GeoEDGES, BMO Capital Markets

  Note: Public production data (Dec, 2018) is raw gas, oil and field condensate (which is rarely reported). Production does not include plant liquids.

Footnotes:

1. Daily Oil Bulletin (DOB) - Weekly Activity Report, Mar 15, 2019
2. BMO Canadian A&D Market Monitor publications; http://www.bmoaddeals.com
3. Alberta Geological Survey WCSB Atlas Figure 16.24
4. NEB Energy Briefing Note, 2013 The Ultimate Potential for Unconventional Petroleum from the Montney Formation of BC and AB
5. Schematic modified from NEB Briefing Note, 2009 A Primer for Understanding Canadian Shale Gas
6. Cross Section modified from CSPG Bulletin, 2018 The Montney Play of Western Canada Vol. 1 Figures 12 and 14
7. Well Counts as of Feb 28, 2019. Producing: produced in the last 12 months (LTM); Standing: no production but RRed in the LTM; Location and Drilling: licensed in last 2 years with no RR date on record