The East Shale Basin Duvernay Continues to Gain Momentum and is Quickly Evolving its Position to Become One of the Premier Oil Resource Plays in North America

Overview

- World-class rock characteristics combined with a massive resource in-place
  - The Duvernay oil fairway within the study area has significant resource potential with an estimated 5 to 25+ MMbbl/section and over >75 Billion bbl oil in place
  - A light oil resource with API gravities between 36° and 45°
  - Thick, over-pressed reservoir with high total organic content (TOC), favourable mineralogy, and low water saturation
- Recent improvements in completion and well design are resulting in top tier prolific wells with IP₃₀ >400 bbl/d and increases expected upon additional optimization
- Advances in drilling efficiency are improving well economics resulting in return rates of >65%
  - Shallower drill depths (<2,600 m) vs. the Kaybob area in the West Shale Basin result in lower capital costs
- Leading North American netbacks of over C$30/boe at current WTI of US$55/bbl - underpinned by strong realized prices (~70-90% liquids weighting), low operating/transportations costs and favourable royalties

Production by Area, Cal boe/d (85% liquids, 137 wells producing)
Highly Economic Shale Oil Play

**East Shale Basin Duvernay – Competitive with the Best Plays in North America**

**North America Shale Basins**

- Montney
- Duvernay
- East Shale Basin
- DJ Basin
- Midland
- Delaware
- Eagle Ford

- **DCE&T (C$ MM Per Well)**
  - DJ Basin: $6.3
  - Westerdale: $6.6
  - Ghost Pine: $6.7
  - Emerging: $7.0
  - Eagle Ford: $11.3
  - Midland: $13.5
  - Delaware: $18.5

- **WTI Break Even (10% Return, US$ / bbl)**
  - Midland: $28
  - Delaware: $30
  - Westerdale: $32
  - Ghost Pine: $34
  - Emerging: $34
  - DJ Basin: $36
  - Eagle Ford: $45

- **Effective Royalty Rate (% Initial 5 Years)**
  - Emerging: 5.0%
  - Westerdale: 5.1%
  - Ghost Pine: 5.6%
  - DJ Basin: 18.8%
  - Eagle Ford: 25.0%
  - Midland: 25.0%
  - Delaware: 25.0%

- **Operating Netback (C$/boe)**
  - Delaware: $38
  - Midland: $36
  - Emerging: $33
  - Ghost Pine: $32
  - DJ Basin: $30
  - Delaware: $30
  - Midland: $29

- **Half Cycle Payout (Years)**
  - Westerdale: 1.2
  - Eagle Ford: 1.4
  - Emerging: 1.5
  - Ghost Pine: 1.7
  - DJ Basin: 2.2
  - Delaware: 3.1

- **Break Even Oil Price**
  - US$32/bbl to US$34/bbl

**Source:** BMO Capital Markets;
Based on flat prices with US$55/bbl WTI and C$1.68/MMBTU AECO, US$2.75/MMBTU HH; $0.76 CAD/USD; US$10/bbl differential to Edm Light
Duvernay well costs reflect pad development; single delineation wells are estimated to cost an additional ~40%

**Notes:**
- Quick Payout < 1.5 Years
- High Netbacks > C$30/boe
- Favourable Crown Royalty Rate
- High Return Rates > 65%
Core Analysis Shows Highly Complex Depositional Systems...

Commentary

- The Ghost Pine and Westerdale embayments are carbonate dominated systems with interbedded organic-rich horizons.
- Both regions have similar mixed porosity elements with conventional carbonate porosity beds between the organic horizons, which may provide better hydrocarbon deliverability.
- The mineralogy of the Emerging oil play at Willesden Green is more siliceous with lower carbonate values, showing a different sediment source to the Westerdale and Ghost Pine embayments. Also notable is the more pervasive TOC. Core (next page) shows the dark black nature of the shale with fewer carbonate intervals.
- With over 85 metres of pay in Westerdale and Ghost Pine areas, operators are initially placing their wellbores within the top 5 to 20 metres of the Duvernay package, and testing in the lower benches is just beginning.
- Ongoing drilling and reservoir testing will increase resource confidence and reserves.
...And Subtle Rock Changes In Each Embayment

Select Core Samples with Unique Features

Emerging
- Willesden Green: 102/10-31-033-24W4/00
  - Limited carbonate interbedding due to onshore sediment source
  - Thick section of massive, siliceous, black, high TOC shale with thin laminae of carbonate
  - 3,260 m TOC 9.58%

Westerdale
- Westerdale: 100/06-20-038-25W4/02
  - Highly fractured shale with thin laminae of carbonate
  - Variable TOC along length of core

Ghost Pine
- Twining: 102/10-18-033-25W4/00
  - Carbonate rich clasts within a dark shale matrix
  - Carbonate beds have nodular texture
  - Calcite healed fractures
  - Soft sediment deformation

Siliceous, low porosity, organic-rich shale
Pre-existing fracture network
High TOC, variable carbonate
High carbonate for greater fracability

Source: Core analysis chart data is from the entire core; AER Submissions; BMO Capital Markets; 102/10-31-033-24W4 core data courtesy Artis

A&D Drill Bits
Page 4
The Duvernay Formation dips to the southwest.

Shows a major thickening of the Duvernay to the southeast reaching up to 100 metres in Westerdale.

High TOC across the entire Duvernay Formation.
Where Is The Oil?

Original Gas in Place (P50 Estimate)\(^{(1)}\)

Original NGL in Place (P50 Estimate)\(^{(1)}\)

Original Oil in Place (P50 Estimate)\(^{(1)}\)

- The maps shown here are taken from the AER’s 2017 Duvernay Resource report, which utilized new data allowing for more robust and new mapping of reservoir attributes compared to the first report published seven years ago.
- Considering this second report was published in mid 2017, the data used was circa 2016 when testing of the East Shale Basin was in its infancy.
- Significant activity in the oil fairway has occurred in the last two years, providing more certainty of oil resource-in-place.
- Should the AER reassess the Duvernay, its likely that the OOIP estimate will increase, especially in areas with proven oil production.

Source: AER, geoscOUT, GeoEDGES, BMO Capital Markets

\(^{(1)}\) AER/AGS Open File Report 2017-02; Hydrocarbon Resource Potential of the Duvernay Formation in Alberta – Update; figures: 24 (OGIP), 25 (NGL in Place), 26 (OOIP)

\(^{(2)}\) Possible wells used in AER Resource Study – Duvernay wells rig released prior to June 30, 2016

\(OOIP \text{ MMbbl per section}\)

\(OGIP \text{ Bcf per section}\)

\(NGL \text{ in Place MMbbl per section}\)
Exploring The Extent Of The Oil Fairway

Over-Pressured Reservoir with the Oil Fairway Seeing a Majority of Recent Activity

**Reservoir Pressure Data & Depth**

- Over-pressed across all three regions
- Linear relationship between reservoir pressure and depth
- More than 230 wells have been drilled in the East Shale Basin since 2012, with the majority being drilled by Vesta in the Westerdale embayment

**Oil Fairway Activity Map**

**Well Activity**

- Drilling activity in the East Shale Duvernay saw rapid growth in 2018

**Confidential Status (Well Count)**

Source: geoSCOUT, GeoEDGES, BMO Capital Markets

Note: All figures are based on data available in the public domain as of February 25, 2019
There is a combination of Freehold and Crown lands across all three embayments in the Duvernay Oil Fairway play.

- Crown lands typically have long tenure; a two year license can roll into a five year lease term with minimal capital spend. This allows operators to be reactive and more strategic with their drilling schedules to hold lands and not be on the drilling “treadmill.”
- Crown lands benefit from drilling incentives (C*) and often result in lower royalty rates.
- Crown lands are tightly held in the heart of the play. Remaining open Crown in the oil window is in the un-tested northern regions where the most recent land sales have been located.

Freehold lands can have a variety of different terms that are directly agreed upon between the parties involved. In general, leases tend to have higher royalty rates than Crown and are less likely to receive offset notices to drill.

- Although Freehold agreements are not publicly available, it is likely that there is little unleased Freehold in the core of the play.
- Freehold lessors have recognized the need to be competitive with Crown royalty structures, with the result they are adjusting their agreements to attract more drilling.
- Exploration wells remain confidential for a year giving operators a strategic advantage in that their drill, complete, test and production details will remain proprietary.
- There are more than 110 confidential Duvernay wells – these nearly outnumber the wells with publicly available data, which is why every well released from confidential status is closely watched.
Who Are The Players?

Nearly All the Land Within the Three Areas is Currently Held

The Players are in Place and Production is Underway

- The East Shale Basin Duvernay is a highly active emerging oil resource opportunity in Western Canada; several private and public companies have amassed considerable land positions
- Vesta, Artis and Baytex are the most active in the play
  - Vesta continues to be the clear leader driving activity with 42 wells being drilled in 2018
  - Excellent results from Artis in Ghost Pine embayment with recent wells showing >500 bbl/d IPs; partnered with Crescent Point on some lands on the south edge
  - Baytex has amassed a meaningful position in the Emerging Area in West Shale Basin and in the East Shale Basin (north of Vesta acreage)
- Most of the prospective Crown and Freehold land is now held
- Producers starting to develop the oil window in the West Shale Basin (led by Baytex and Paramount), with recent land sales focused on the remaining acreage in this window

Duvernay Sections Shown On Map

Source: geoSCOUT, GeoEDGES, BMO Capital Markets, public disclosure and corporate presentations (based on available data as of February 25, 2019)

(1) Includes acreage shown on the map up to Township 50
(2) Journey-Kiwtinohk JV, Paramount and Repsol section counts only include land in the Emerging Oil Area closest to the Kimbey Leduc Trend
Massive OOIP with Large Potential Inventory Within Each of the Embayments

Duvernay Oil Fairway – Resource Overview

Estimate of Possible Future Inventory Using 6 Wells Per DSU

- The number of wells drilled today represents <3% of the total inventory on the company acreages shown above at 6 wells per DSU.
- The upside inventory could exceed >12,000 locations on the publicly disclosed company acreages assuming tighter well spacing or multiple benches.

Notes:

1. Future Inventory assumes one platform (bench) developed with 2 mile laterals, 6 wells per 2 section DSU and 80% utilization factor on company held sections.

Source: geoSCOUT, public disclosure and corporate presentations (based on available data as of February 25, 2019)
Ghost Pine Activity & Recent Well Results

Top Performing Wells in West Ghost Pine With Near Term Activity Proving up East Ghost Pine

Ghost Pine Embayment Overview Map

North Key Well
Artis 02-26-034-24W4
On: 2017/12/20
2,693 m LL
Oil IP30: 384 bbl/d (choked back)

Artis 01-11-034-24W4  API 36°
On: 2015/04/07
1,558 m LL & 1,448 t Proppant
Oil IP30: 258 bbl/d

South Key Well
Artis 11-27-031-25W4/02
On: 2017/09/28
2,352 m LL & 4,830 t Proppant
Oil IP30: 567 bbl/d

Artis 13-11-031-25W4
On: 2017/10/11
2,327 m LL & 4,770 t Proppant
Oil IP30: 505 bbl/d

Artis & Crescent Point Partnership

Early stage development with no production results, therefore no type curve available

South Key Well
Artis 102/04-15-031-24W4  API 42°
On: 2017/01/01
2,110 m LL & 4,645 t Proppant
Oil IP30: 560 bbl/d

2018 Activity

Source: geoSCOUT, GeoEDG, BMO Capital Markets
Note: All figures are based on data available in the public domain as of February 25, 2019
Includes all activity prior to February 25, 2019 and wells that have been spud, drilled and/or rig released
High Rates in the South Resulting in Strong Returns of 70%

Type Curves

Cal Day Oil Rate per 100 m LL (bbl/d)

Month

Type Curve Parameters and Economic Results (Crown Royalty)

<table>
<thead>
<tr>
<th></th>
<th>Ghost Pine North</th>
<th>Ghost Pine South</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP₃₀ (bbl/d)</td>
<td>409</td>
<td>593</td>
</tr>
<tr>
<td>Uti Rec (Mboe)</td>
<td>362</td>
<td>568</td>
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<tr>
<td>C₂ - C₄ (bbl/MMcf)</td>
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<td>C₅+ (bbl/MMcf)</td>
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<td>BT- NPV₁₀ (%)</td>
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<td>IRR (%)</td>
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<td>Payout (yrs)</td>
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<td>NPV₁₀ ($MM)</td>
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<td>EUR (Mboe)</td>
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<td>568</td>
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<tr>
<td>Capital (MM)</td>
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<td>$6.7 MM</td>
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<td>Gas Price ($/GJ)</td>
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South Type Curve Economic Sensitivities

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<thead>
<tr>
<th>WTI Oil Price (US$/bbl)</th>
<th>Change in IRR from base value of 70%</th>
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<tbody>
<tr>
<td>$40/bbl</td>
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<tr>
<td>$55/bbl</td>
<td>$55/bbl</td>
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<tr>
<td>$70/bbl</td>
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</table>

Note: Based on flat prices with US$55/bbl WTI and C$1.68/MMBTU AECO, 50.76 CAD/USD; US$10/bbl differential to Edm Light

Commentary

• The Ghost Pine embayment has seen less drilling/licensing activity than Westerdale, but recent well and land sale results suggest activity will increase
• Core Duvermay land rights are fully held within the area
• Artis has been the most active company in Ghost Pine since the area was originally tested in 2015 but additional operators such as Chronos, Crescent Point and Outlier are further delineating the area
• Public data indicates that production rates within the Ghost Pine embayment are highly comparable to results seen within the more active Westerdale embayment
Vesta is the Most Active Operator With >100 Wells Drilled to Date and High Production Performance Across Their Land Base

**South Key Wells**
- Vesta 08-15-039-28W4/02
  - On: 2018/01/09
  - 3,073 m LL
  - Oil IP₃₀: 764 bbl/d
- Vesta 102/14-13-039-28W4
  - On: 2018/06/29
  - 3,069 m LL
  - Oil IP₃₀: 565 bbl/d
- Vesta 02-20-043-25W4
  - On: 2018/04/04
  - 3,142 m LL
  - Oil IP₃₀: 595 bbl/d

**Active South Extension**
- 17 wells Drilled in 2018 (6 cased wells)
- 5 well licenses

**North Key Wells**
- Vesta 102/08-02-040-27W4
  - On: 2018/07/06
  - 3,779 m LL
  - Oil IP₃₀: 536 bbl/d
- Vesta 05-24-040-27W4/02
  - On: 2018/02/23
  - 3,209 m LL & 7,150 t Proppant
  - Oil IP₃₀: 409 bbl/d

**Baytex**
- Baytex 04-11-044-27W4/02
  - On: 2017/11/06
  - 2,226 m LL
  - Oil IP₃₀: 196 bbl/d
- Baytex 04-11-044-27W4/03
  - On: 2017/10/24
  - 3,035 m LL & 4,731 t Proppant
  - Oil IP₃₀: 374 bbl/d
- Baytex 04-11-044-27W4/02
  - On: 2017/11/02
  - 3,051 m LL
  - Oil IP₃₀: 400 bbl/d
- Baytex 02-20-043-25W4
  - On: 2018/07/19
  - 3,552 m LL
  - 80 boe/d (77% oil and NGLs)

**Vesta**
- Vesta 102/08-15-039-28W4/02
  - On: 2018/03/21
  - 3,213 m LL
  - Oil IP₃₀: 524 bbl/d
- Vesta 100/16-06-039-27W4
  - On: 2018/06/18
  - 3,135 m LL
  - Initial Oil IP₃₀: 532 bbl/d
- Vesta 100/02-09-037-28W4/02 & 102/02-09-037-28W4/04
  - On: 2018/06/05
  - 3,037 & 3,047 m LL
  - Oil IP₃₀: 524 & 556 bbl/d

**Source:** geoSCOUT, GeoEDGES, BMO Capital Markets

**Note:** All figures are based on data available in the public domain as of February 25, 2019. Includes all activity prior to February 25, 2019 and wells that have been spud, drilled and/or rig released.
Westerdale – Type Curve & Economics

Impressive IRR of 46% to 87% Based on Current Pad Well Costs

Type Curves

Type Curve Parameters and Economic Results (Crown Royalty)

South Type Curve Economic Sensitivities

Commentary

- The Westerdale embayment has been the most active part of the East Shale Basin, predominantly driven by Vesta’s development
- Vesta has seen better well performance with increased sand density and lateral lengths
- Recent wells have increased over 25% in the past few years to an average of 3,300 m; the longest well drilled by Vesta has a lateral length of >3,750 m
- Recent wells completed in the southern core of Vesta acreage are showing extensive oil, with IP30 rates of over 600 bbl/d
Emerging Area Activity & Recent Well Results

Recent Well Results Confirm the Presence of the Light Oil Window on the West Side of the Rimbey – Leduc Reef Complex

- **Baytex 103/14-36-046-02W5**
  - On: 2018/03/23
  - 2,478 m LL
  - Initial Oil IP 30: 224 bbl/d

- **South Key Well**
  - Paramount 05-29-039-04W5/02
  - On: 2018/07/23
  - 2,545 m LL
  - Initial Oil IP 30: 667 bbl/d

- **North Key Wells**
  - Baytex light oil discovery, 2 wells
  - Initial Oil IP 30: 750 boe/d (88% oil & NGLs)

- **Repsol Ferrier ultra-rich gas play**
  - Liquids API >50°

- **Journey / Kiwetinohk**
  - Repsol 02-30-040-04W5 Gas Well
  - Liquids API 40° – 45°

- **2018 Activity**
  - Paramount 103/16-13-039-05W5/02
    - On: 2018/07/23
    - 2,545 m LL
    - Initial Oil IP 30: 373 bbl/d (choked back)

- **Emerging Area Overview Map**

- **Note:** All figures are based on data available in the public domain as of February 25, 2019. Includes all activity prior to February 25, 2019 and wells that have been spud, drilled and/or rig released.
Emerging Area – Type Curve & Economics

A Promising Area For Development With IRRs Ranging From 32% to 66%

Type Curves

Emerging South WSB
Emerging North WSB

Cal Day Oil Rate per 100 m LL (bbl/d)

Month

IP₃₀ – 527 bbl/d
NPV₁₀ = $6.9MM
IRR = 66%
EUR = 590 Mboe

IP₃₀ – 398 bbl/d
NPV₁₀ = $3.2MM
IRR = 32%
EUR = 394 Mboe

Type Curve Parameters and Economic Results (Crown Royalty)

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<tr>
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<th>Emerging North</th>
<th>Emerging South</th>
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<td>IP₃₀ (bbl/d)</td>
<td>398</td>
<td>527</td>
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<td>Uil Rec (Mboe)</td>
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<td>C₂ - C₄ (bbl/MMcf)</td>
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<td>C₅+ (bbl/MMcf)</td>
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<td>GOR (scf/bbl)</td>
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<td>Capital ($MM)</td>
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Rate of Return Sensitivity on Base Type Curve:
BT-NPV₁₀ = $6.9MM; IRR = 66%

<table>
<thead>
<tr>
<th>WTI Oil Price (US$/bbl)</th>
<th>Capital ($MM)</th>
<th>IP (30-day, bbl/d)</th>
<th>GOR (scf/bbl)</th>
<th>Gas Price ($/GJ)</th>
<th>Freehold Royalty: 10%</th>
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<tr>
<td>$40/bbl</td>
<td>+20%</td>
<td>423 bbl/d</td>
<td>2,810 scf/bbl</td>
<td>$1.10/GJ</td>
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<td>$70/bbl</td>
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<td>632 bbl/d</td>
<td>4,220 scf/bbl</td>
<td>$2.10/GJ</td>
<td>$7.0MM $-20%</td>
</tr>
</tbody>
</table>

Commentary

• The emerging area is the most active land sale area in the East Shale Basin with recent well results further spurring on additional interest
• Well licensing activity over the last year primarily targeted the oil window
• Land within the mapping area is mostly held, with August Crown land sales picking up the remaining acreage offsetting Crescent Point and Baytex’s land positions
• Preliminary results in the emerging area are very encouraging, and activity is expected to increase
Egress is easing...

**Legislated Production Limits are Easing the Differentials and Improving Economics**

**Edmonton Oil Price Differential to WTI**

- Crude oil stocks are at all time lows, primarily due to price differentials and backwardation as owners cannot afford to store crude with future prices lower than current prices.
- The WCSB produced 3.99 MMbbl/d of oil in 2017 and has continued to grow to 4.3 MMbbl/d in 2018.
- Takeaway name plate pipeline capacity from the WCSB as of Sept 2018 was 3.95 MMbbl/d, although actual throughput is often less.
- Until the lack of pipeline capacity is remediated, transportation is quickly being taken up by rail.
- Canadian rail is capable of transporting up to 900 Mbbl/d but requires significant investment which is being funded by the Alberta Government and industry.
- Canadian rail loading facilities have an estimated capacity of 1.2 MMbbl/d. However, maximum transportation capacity is much lower at 400-500 Mbbl/d and will require significant investment from the rail companies to be achieved.

**Commentary**

- Strip Edm diff for 2019 ~US$8-9/bbl
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI

**Canadian Crude Oil Pipeline Access**

- The pipeline gap is growing
- Current expansions

**Canadian Crude Oil Supply and Egress**

- Record breaking volumes for 8 consecutive months
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI

**Alberta Duvernay Crude Oil Pipeline Access**

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- Canadian rail loading facilities have an estimated capacity of 1.2 MMbbl/d. However, maximum transportation capacity is much lower at 400-500 Mbbl/d and will require significant investment from the rail companies to be achieved.

**Canadian Crude Oil Exports by Rail**

- Record breaking volumes for 8 consecutive months
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI
- Edmonton Oil Price Differential to WTI

**Source:** geoSCOUT, GeoEDGES, BMO Capital Markets

(1) Sproule Commodity Price Outlook, Bloomberg Strip Pricing March 11th, 2019

(2) 2018 Crude Oil Forecast: Markets and Transportation, Canadian Association of Petroleum Producers, BMO Capital Markets, Statistics Canada

(3) NEB: Canadian Crude Exports by Rail-Monthly Data. November 2018; Western Canadian Crude Oils Supply, Markets & Pipeline Capacity, December 2018
It’s Time To Get The Word Out! Duvernay Rocks!

All the Key Elements of a Highly Profitable World-Class Resource Play are Right Here

- Most Prolific And Economic Oil Shale Play In Canada
- Repeatable Well Results Across Multiple Embayments
- Green-Field Oil Reservoir With Material Production Information Being Made Public Over The Next Year
- Shallow, Thick, Over-Pressed Light Sweet Oil Reservoir With Multiple Platforms To Develop
- High TOC Content In A Carbonate-Rich Shale With Abundant Natural Fractures
- Easy year-round access, close to key transportation and egress infrastructure

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