A&D DRILL BITS

March 6, 2012
The Duvernay Shales have been credited as the source rock for many of the large Devonian oil and gas pools in Alberta, including the most famous, The Leduc Field discovered in 1947.

With the successful development of unconventional shale reservoirs elsewhere in North America, attention has shifted to the Duvernay Shales in Alberta.

In central Alberta, the Duvernay Shale Basin spans approximately 50,000 square miles, much of which is within the thermally mature or “wet” gas window.

An estimated 7,500 square miles is thought to be in the liquids-rich gas window where reported liquid recoveries range from 75 to 150 bbl/MMcf.

The Duvernay compares favorably to other North American Shale plays, showing good porosity, overall thickness, organic content and is overpressured - all of which are key to a successful play.

Liquid content combined with a resource potential of 80-100 Bcf/section has led to a modern day gold rush to establish land positions.

Since the fall of 2009 we estimate more than $3.9B has been spent at Crown land sales to acquire land positions and to drill wells.

Much of this land sale activity has occurred under “broker” names thus leaving the true owner anonymous as the coveted land positions were obtained and only recently have operators begun to expose their land positions.

We have split the play into three areas: Kaybob which has seen the most development; Pembina where significant sale activity has occurred within the last year; and Edson where sale activity has just begun.

### Duvernay Shales - The New Millennium Gold Rush

#### North American Shale Plays

<table>
<thead>
<tr>
<th>Geologic Age</th>
<th>Horn River (Muskwa)</th>
<th>Montney</th>
<th>Duvernay</th>
<th>Eagle Ford</th>
<th>Marcellus</th>
<th>Barnett</th>
<th>Haynesville</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geologic Age</td>
<td>Devonian</td>
<td>Lower Triassic</td>
<td>Devonian</td>
<td>Cretaceous</td>
<td>Devonian</td>
<td>Mississippian</td>
<td>Jurassic</td>
</tr>
<tr>
<td>Depth (m)</td>
<td>2500 - 3000</td>
<td>up to 4000</td>
<td>2500-4000</td>
<td>1830-3658</td>
<td>30-90</td>
<td>1520-2440</td>
<td>1825-2575</td>
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<tr>
<td>Thickness (m)</td>
<td>150</td>
<td>up to 300</td>
<td>10-70</td>
<td>60-30</td>
<td>15-107</td>
<td>90-150</td>
<td>45-105</td>
</tr>
<tr>
<td>Porosity (%)</td>
<td>3-7</td>
<td>3-7</td>
<td>3-15</td>
<td>2-6</td>
<td>3-9</td>
<td>3-9</td>
<td>8-15</td>
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<tr>
<td>Total organic content (%)</td>
<td>2-5</td>
<td>2-5</td>
<td>1-20</td>
<td>2-6</td>
<td>3-10</td>
<td>3-8</td>
<td>1-5</td>
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<tr>
<td>Quartz Content (%)</td>
<td>55-80</td>
<td>20-45</td>
<td>1-47</td>
<td>5-20</td>
<td>25-40</td>
<td>40-60</td>
<td>20-35</td>
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<tr>
<td>Clay (%)</td>
<td>7-10</td>
<td>11</td>
<td>3-37</td>
<td>15-25</td>
<td>20-35</td>
<td>10-30</td>
<td>25-35</td>
</tr>
<tr>
<td>GIP/section (Bcf)</td>
<td>60 to 318</td>
<td>8 to 160</td>
<td>80-100</td>
<td>100 -210</td>
<td>20-100</td>
<td>50-200</td>
<td>100-250</td>
</tr>
<tr>
<td>Gradient (psi/ft)</td>
<td>0.5-0.7</td>
<td>0.5-0.6</td>
<td>0.68-0.78</td>
<td>0.55-0.73</td>
<td>0.32-0.8</td>
<td>0.46-0.53</td>
<td>0.7-0.9</td>
</tr>
</tbody>
</table>

Source: BMO Capital Markets, Core Labs C. Hall 2010, Marc Bustin 2010
Why the Rush – What Makes the Duvernay so Prospective?

Attributes of a Successful Shale Play

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Desired</th>
<th>Duvernay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithology</td>
<td>fine grained</td>
<td>✓</td>
</tr>
<tr>
<td>Thickness</td>
<td>&gt;40 m</td>
<td>10-70</td>
</tr>
<tr>
<td>TOC</td>
<td>&gt;1%</td>
<td>1-20</td>
</tr>
<tr>
<td>Effective Porosity</td>
<td>&gt;2.5%</td>
<td>3-15</td>
</tr>
<tr>
<td>Pressure Gradient</td>
<td>&gt;0.5 psi/ft</td>
<td>0.68-0.78</td>
</tr>
<tr>
<td>Mud Log</td>
<td>evidence of gas</td>
<td>✓</td>
</tr>
</tbody>
</table>

There are a number of attributes that are key indicators for a successful shale gas play - all of which are present in the Duvernay. Confirmation of these attributes was available prior to the beginning of the land rush in late 2009, particularly in the Kaybob area:

- **Lithology** - fine-grained and silica (quartz) rich. Fine-grained rocks have increased total surface area which equates to higher adsorbed gas component in organic-rich rocks. silica-rich rocks are more brittle allowing for more effective fracture treatments.

- **Reservoir thickness** – required for storage and ultimate economics of the play.

- **TOC** – total organic carbon – measures the organic matter (hydrocarbon source material) that was preserved in the rock. The amount of adsorbed gas is related to the organic material.

- **Effective Porosity** – pore space required for storage of hydrocarbons once generated from the organic material contained in the rock.

- **Pressure Gradient** – overpressured reservoirs allow for increased storage and will also impact deliverability positively.

- **Mud Logs** – confirm the organic material has matured to create hydrocarbons, as gas occurs naturally in the formation.

Q4 2009 marked the beginning of the land rush, showing a 300% increase in the area sold and a 650% increase in the average cost per hectare compared to Q3 2009.

Since October 2009, over $3.44 billion has been spent on 1.5 million hectares (5,750+ sections).

The Kaybob area was the first to see land sale activity thought to be associated with the Duvernay and is the area that is most mature in the overall development of the play.

The histogram includes sale data in the three areas studied; Kaybob, Pembina and Edson.
The Duvernay – a Regional Resource with an Estimated 750 Tcf in the Liquids-Rich Gas Window

The approximate oil and gas edges are derived from thermal maturity isotherms based on vitrinite reflectance and equivalent data.

- Duvernay locations are concentrated in the “wet” gas window, where operators are having success producing liquids-rich gas from horizontal wells with multi-stage fracture completions. This window is contained between $R_o$ of 1.0 to 1.8%.
- West of the $R_o$ line of 1.8% we would expect the gas to be dry.
- We estimate the liquids-rich gas window to be approximately 7,500 square miles and contain 750 Tcf of gas.

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The Duvernay was deposited in a broad marine setting as a basin-filling shale, surrounded by and coeval with the Leduc reef build-ups.

- At maximum sea-level transgression, rapid basin-filling resulted in enormous quantities of organic sediment being dumped in the deep, oxygen-starved basin. These are the Duvernay source rocks where total organic carbon (TOC) is as high as 20%.
- Duvernay proximal to Leduc reefs will contain skeletal debris, which increases overall thickness and enhances the porosity and permeability.

Source: WCSB Atlas fig12.17, Sherwin GeoEDGES, GeoSCOUT, BMO Capital Markets

Inset Schematic adapted from Potma et.al. 2001

The study area encompasses the Kaybob, Edson, and Pembina wet gas fairway, located in the West Shale Basin and East Shale Basin. The approximate edge gas window is shown, indicating the area where operators have been successful in producing liquids-rich gas from horizontal wells with multi-stage fracture completions. This window is contained between $R_o$ of 1.0 to 1.8%.

West of the $R_o$ line of 1.8%, the gas is expected to be dry.

We estimate the liquids-rich gas window to be approximately 7,500 square miles and contain 750 Tcf of gas.

Source: GeoEDGES, GeoSCOUT, BMO Capital Markets
Areally Extensive – an Average of 50 m Thick Interval Over 280 km

The regional stratigraphic section above starts with a vertical well at Kaybob which is proximal to the Celtic/Trilogy/Yoho well which was the first horizontal Duvernay well drilled in 2010. Here the Duvernay is 64 m thick and the horizontal leg is at a depth of 3,270 m TVD.

The Duvernay interval at Edson where CNRL is currently drilling a horizontal well is 35 m thick, and shows a compressed log signature. Duvernay thickness is affected by the presence of the underlying Swan Hills Bank, the edge of which trends through the Edson area. Duvernay thicknesses similar to Kaybob are found off of the bank edge.

The Pembina well shown on the section is close to the ConocoPhillips horizontal producer which is confidential until this fall. Here, the Duvernay is 60 m thick and the horizontal leg is at ~3,100 m TVD.

The two cored wells are close to Leduc buildups which results in increased Duvernay thickness due to skeletal debris.

The core from 06-13-058-18W5 shows millimeter wide silt beds in the dark bituminous shale. These higher permeability beds will act as conduits for oil or gas deliverability.

In core from the 07-01-041-03W5 Gilby well, the shale has 5 – 10 cm wide interbeds of hard brittle shale and more organic ductile beds. The hard shale beds contain 1 – 2 cm spaced vertical fractures, where druse calcite has grown and been coated with hydrocarbon. Where fractures are present, permeability of the rock will increase from nanodarcy to darcy scale.

Both Core Labs and Trican/CBM Solutions and the ERCB have detailed reservoir characterization and production property studies for the Duvernay.
The Thermally Mature Duvernay is Overpressured, Positively Impacting Deliverability and Storage

- Pressure data reveals significant overpressuring in the Duvernay, a beneficial attribute to have in permeability challenged, liquids-rich reservoirs as it not only helps with deliverability but also increases storage.
- In the Pembina–Edson area, Duvernay-sourced oils fill many Nisku reservoirs, many of which are also overpressured at similar depths to the Duvernay.
- Where Vitrinite isotherms are between 1.0 and 1.8, the Duvernay is within the wet gas window for hydrocarbon generation. These isotherms also bound the majority of the activity in the fairway, where liquid yields are high and include free condensate.

**Duvernay Pressure vs Depth**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Pressure (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1,000</td>
<td>10,000</td>
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<tr>
<td>2,000</td>
<td>20,000</td>
</tr>
<tr>
<td>3,000</td>
<td>30,000</td>
</tr>
<tr>
<td>4,000</td>
<td>40,000</td>
</tr>
<tr>
<td>5,000</td>
<td>50,000</td>
</tr>
<tr>
<td>6,000</td>
<td>60,000</td>
</tr>
</tbody>
</table>

**Overpressured Duvernay Wet Gas Fairway**

- Overpressured Duvernay locations
- Duvernay location Ro sample point
- Wet Gas Window (Ro 1.0% - 1.8%)
- Gas / Oil Window
- Duvernay Bituminous Shale
- Overpressured Nisku
- Nisku Margin
- Leduc buildups
- Slave Point / Swan Hills

**Thermal Maturation**

- Vitrinite Reflectance (%Ro)
- Weight % Carbon in Kerogen

Source: Adapted from Dow 1977

Source: GeoEDGES, GeoSCOUT, BMO Capital Markets
Kaybob – Duvernay Land Sale Activity Started here in Late 2009 with $1.8B Spent to Date

- Nine very large blocks were sold in Q4-2009 at $2,500+/ha (pink & red blocks indicated on map). All nine were purchased under broker name for a total of $323MM. Subsequently, Husky, Talisman and Encana have licensed or drilled wells into these leases.

- The first Duvernay horizontal in the area (Celtic 15-33-060-2W5) was rig-released in Q3-2010, which coincides with the next big land sale quarter. Much of the land sold in the last half of 2010 is north of the Wild River Sub-Basin, those leases close to the successful Celtic well.

- The large purple lease in Township 061-20W5 is immediately north of Celtic’s well, this ~16 section block sold to broker in August 2010 for $42.3MM

- The 2011 sales were focused north-east of the gas window in the Swan Hills platform area, as well as in the west between Fir and Simonette. During the year, land sales generated $892MM for 1,076 sections, and the vast majority of this went to brokers.

- Currently, there is very little Open Crown remaining in the prospective Duvernay fairway. The March land sale parcels are posted in yellow on the map, these are small postings, typically one or two section leases.

- New Duvernay players trying to enter at Kaybob must either acquire or joint venture with existing operators to gain any footprint in the area.

- As a result activity around divestiture and joint ventures has accelerated.

Source: Government of Alberta, GeoSCOUT, GeoEDGES, BMO Capital Markets
Kaybob – Tightly Held Land Base with Numerous Active Operators - 37 Wells Drilled or Drilling and 12 Licensed

- Activity since the first Celtic/Yoho/Trilogy well in 2010 has been brisk, with 37 wells (horizontal and vertical) either drilled or drilling and a further 12 licensed. For each operator, the histogram shows well counts in two ways, vertical & horizontal count, and well status count (license, drilling, rig-released, producing). Several operators are shown to be evaluating the play using vertical wells (blue) prior to drilling horizontally.

- Of note is the activity by large caps/international oil companies such as Shell, Chevron, Husky, Talisman and Encana. The two most active operators are Encana and Celtic. However recall Celtic is partnered with Yoho and Trilogy on about 30 sections of land.

- The land colour on the map reflects the ownership; grey lands are publically held Crown, blue is held under broker and green is freehold. Duvernay rights are very tightly held in the area, and a very large portion of the rights are held in broker name. This makes it problematic to determine true land positions without company disclosure – see the back of this report where company disclosures are discussed.

- The Duvernay in the Kaybob area is predominantly within the thermal “gas-window” of hydrocarbon generation. Thermal maturation increases to the southwest, as does depth, and locations situated within the Wild River Sub-Basin may produce dryer gas than at Kaybob proper. In this portion of the reservoir we see just two wells attempted to date by Talisman and Husky and a recent horizontal license by Encana.
Various operators began testing the Duvernay in 2010 by re-entry, re-completions and/or drills (vertical and horizontal).

Currently, seven wells are producing or have tested gas and 23 wells are standing, with several of these reported to be awaiting completion. Eight wells are drilling with a dozen additional licenses.

Most of the Kaybob activity is in the wet gas window, where Ro values are between 1.0 and 1.8. Operators routinely press-release that total NGLs are over 75 bbl/MMcf plus an equivalent production of free condensate.

As operators continue testing the play with new drills, the areas prone to oil, wet gas and dry gas will be refined. Examples of this are Athabasca Oil Sands’ recently rig-released well in the oil window (02/07-18-064-17W5) and Encana’s horizontal license in the dry-gas window (11-34-057-23W5).

Operators are reporting that all-in costs for a Duvernay horizontal with multi-stage fracture completion are typically $12MM, with some operators suggesting that $10MM will become the average price as the play develops.

We estimate that at Kaybob as much at $370MM has been spent to date on drilling.
Pembina – The Rush Continues with $1.4B Spent to Date at Land Sales

- At Pembina, land sale activity for Duvernay Crown PNG began to heat up in Q4-2010 about a year after it began at Kaybob. During that quarter, seven large blocks (32 sections each) sold to brokers for a total bonus of $144.5MM.
- Heated activity continued in 2011 when a remarkable $1,084MM was spent for 1,189 sections of Crown in the Pembina area.
- As the land rush continued in late 2010 and into 2011, individual lease size increased to where 81% of the total land area sold belonged in leases of at least six sections in size (1,536 hectares, 3,840 acres).
- 2012 land sales already total 115 sections for total bonus of $36.7MM after only three land sales.
- PNG rights are now largely held in the prime parts of the Duvernay fairway, and future sale parcel size is expected to get smaller.
- March land sale parcels are posted in yellow, with only one parcel being of any significant size (17 sections).

**Crown Land Sales Price Thermometer Map**

- Q4-2010: seven large blocks for $144.5MM
- March parcel: 17 sections

**$1.4 Billion Spent Since Q4 2009**

- Source: Alberta Government, GeoSCOUT, BMO Capital Markets

**Lease Size Increased in Q4 2010**

- Source: Alberta Government, GeoSCOUT, BMO Capital Markets

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*Source: Alberta Government, GeoSCOUT, BMO Capital Markets*
Pembina Activity – Operators Beginning to Drill With Nine Wells Drilled or Drilling and Five Licensed

As with Kaybob much of the activity surrounds national oil companies/large caps such as ConocoPhillips, Encana, Talisman, Sinopec/Daylight and Bonavista.

Smaller operators such as Bellatrix, Sirius and Yoho are all active at Pembina.

To date, nine wells have been drilled or are underway, with a further five licensed.

Much of the Crown lands purchased to date have been bought by brokers to maintain the anonymity of the purchaser. The large amount of broker held land speaks to the fact that the Duvernay Resource Play is in an early stage of development. Occasionally, operators will even license and drill under broker as is the case in the Antelope well in Township 045-06W5.

The east side of the map sheet tags the edge of a vast freehold checkerboard; in the Pembina area, Encana is the primary freehold owner with some of its lands having been leased by Bonavista with the purchase of the Encana Hoadley assets. On the west side of the map Bellatrix’s license is on O’Chiese First Nation lands.

Duvernay well licensing at Pembina began in April 2011 (Q2-2011), the same quarter in which much land was sold across the area.

ConocoPhillips drilled the first Pembina Duvernay wells beginning with a vertical/horizontal pair in Township 044-07W5, rig-released last October. Gas production in the horizontal well (02/11-16-044-07W5) began last November. ConocoPhillips’ other horizontal well at 07-11-045-07W5 was rig-released in December, and is reported to have tested gas (DOB Weekly Drilling Report Jan 27).
Pembina Drilling Results – with an Estimated $90MM Spent on Drilling

- Drilling and licensing in Pembina is less active than Kaybob, with only one well reporting results (Conoco Phillips 02/11-16-044-04W5) and four more spud or rig-released since December 2011.

- One historic pressure result shows that the Pembina Duvernay is similarly over pressured to Kaybob, i.e., 07-03-047-11W5 had a pressure of 52.4 MPa at a run depth of 3,373 m (15.5 kPa/m or 0.7685 psi/ft) in 1979.

- In addition, this same well reported 1-hour condensate test rates throughout 1979 ranging from 2.87 m$^3$/hr to 7.50 m$^3$/hr (434 bbl/d to 1,132 bbl/d).

- The ConocoPhillips well (02/11-16-044-07W5) has a reported gas rate of 1.468 MMcf/d plus 30 bbl/d of oil. This well is still confidential, so these are calendar day rates with no indication of production hours, so these represent minimum values.
Edson – the Newest “Subdivision” in the Duvernay Resource Play

- The first noticeable difference at Edson is that the land sale colours are not as “hot”, nor the leases sold (since Q4 2009) as areally extensive as was observed at Pembina and Kaybob with just $378MM spent to date on lands in this area
- The central part of Edson is where both Duvernay locations are found and the majority of these lands sold in the last half of 2011
Edson – Two Wells Drilled To Date

In July of last year, Angle Energy drilled a vertical Duvernay test well at 04-36-052-17W5, which is confidential until this summer.

CNRL is currently drilling a horizontal well at 01-03-052-17W5. The horizontal leg is immediately next to a 1990 vertical well which shows the Duvernay to be 35 m thick. This vertical well is on the cross-section shown on page three.

The PNG rights are currently held for all of the coloured lands on the map above; light grey lands are publically held by company, blue lands are held by broker, and green is freehold. The uncoloured land reflects open rights in the Duvernay, and this is extensive. Positive results from either of these two wells may spark another land sale rush in the Edson area.

Regional Duvernay Isotherms are shown on the map, based on GSC Open File 4341. The only $R_o$ control wells in the area are on the east side of the map. Both Duvernay wells appear to be in the drier parts of the gas window (i.e. greater than $R_o=1.8$), although the actual nature of Duvernay hydrocarbons at Edson has yet to be revealed.
### Disclosed Operator Positions

#### Duvernay Players

<table>
<thead>
<tr>
<th>Active Players in Study Areas</th>
<th>Disclosed Land Position</th>
<th>Strike Areas</th>
<th>Operated Well count in Study Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alta Energy Partners</td>
<td>n/a</td>
<td>Kaybob</td>
<td>1</td>
</tr>
<tr>
<td>Angle</td>
<td>218 net sections</td>
<td>Edson</td>
<td>1</td>
</tr>
<tr>
<td>Athabasca Oil Sands</td>
<td>1000 sections</td>
<td>Kaybob and north</td>
<td>6</td>
</tr>
<tr>
<td>Bellatrix</td>
<td>43 net sections</td>
<td>Pembina</td>
<td>1</td>
</tr>
<tr>
<td>Bonavista</td>
<td>400 net sections</td>
<td>Willesden Green (Pembina)</td>
<td>1</td>
</tr>
<tr>
<td>Canadian Natural</td>
<td>602 sections (385,000 acres)</td>
<td>Edson</td>
<td>1</td>
</tr>
<tr>
<td>Celtic</td>
<td>169 net sections</td>
<td>Kaybob</td>
<td>9</td>
</tr>
<tr>
<td>Chevron</td>
<td>391 net sections (250,000 net acres)</td>
<td>Fox Creek (Kaybob)</td>
<td>4</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>n/a</td>
<td>Pembina</td>
<td>3</td>
</tr>
<tr>
<td>Encana</td>
<td>586 net sections (375,000 net acres)</td>
<td>Simonette, Kaybob, Willesden Green</td>
<td>12</td>
</tr>
<tr>
<td>Husky</td>
<td>86 net sections (55,000 net acres)</td>
<td>Kaybob</td>
<td>6</td>
</tr>
<tr>
<td>Navarone</td>
<td>n/a</td>
<td>Kaybob</td>
<td>1</td>
</tr>
<tr>
<td>Petrobakken</td>
<td>190 net sections (includes other zones)</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Shell</td>
<td>n/a</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Sinopec Daylight</td>
<td>203 net sections (130,000 net acres)</td>
<td>Pembina</td>
<td>1</td>
</tr>
<tr>
<td>Sirius</td>
<td>35 sections</td>
<td>Pembina</td>
<td>2</td>
</tr>
<tr>
<td>Talisman</td>
<td>563 sections (360,000 acres)</td>
<td>Kaybob and Pembina</td>
<td>4</td>
</tr>
<tr>
<td>Taqa North</td>
<td>n/a</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Trilogy</td>
<td>207 net sections</td>
<td>Kaybob</td>
<td>2</td>
</tr>
<tr>
<td>Yoho</td>
<td>17.7 net sections</td>
<td>Kaybob and Ferrier (Pembina)</td>
<td>3</td>
</tr>
</tbody>
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#### Other Duvernay Players

<table>
<thead>
<tr>
<th>Active Players in Study Areas</th>
<th>Disclosed Land Position</th>
<th>Strike Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook*</td>
<td>70 sections</td>
<td>NW of Kaybob</td>
</tr>
<tr>
<td>Delphi*</td>
<td>79 net sections</td>
<td>Sturgeon Lake (north of Kaybob)</td>
</tr>
<tr>
<td>Enenplus</td>
<td>59 net sections (38,000 net acres)</td>
<td>not specified</td>
</tr>
<tr>
<td>Guide*</td>
<td>547 net sections (350,000 net acres)</td>
<td>Sturgeon Lake (north of Kaybob)</td>
</tr>
<tr>
<td>Mako</td>
<td>141 sections (90,000 acres)</td>
<td>Pembina</td>
</tr>
<tr>
<td>Sonde*</td>
<td>61 net sections (39,000 net acres)</td>
<td>Ante Creek/Bezanson (north of Kaybob)</td>
</tr>
<tr>
<td>Waldron</td>
<td>23 net sections</td>
<td>Crystal (Pembina) &amp; Ferrybank</td>
</tr>
<tr>
<td>Yarangar</td>
<td>70 net sections</td>
<td>Edson/Pembina</td>
</tr>
</tbody>
</table>

#### Strategic Alternatives / Corporate Sale

<table>
<thead>
<tr>
<th>Disclosed Land Position</th>
<th>Strike Areas</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birchoff</td>
<td>195 net sections (124,800 net acres)</td>
<td>Kaybob and NW</td>
</tr>
<tr>
<td>Anglo Canadian Oil</td>
<td>104 sections</td>
<td>East Shale Basin (ESB)</td>
</tr>
</tbody>
</table>

#### Joint Venture

- Mako/Woma/Warren: 80% of 30 sections | Pembina | Nov 2011

#### Asset Sale / Farmout

- B&G Energy: 73 sections | Kaybob | Sept 2011
- Conmacher: 26 sections | NW of Kaybob | Oct 2011
- PennWest: not specified | Simonette (NW Kaybob) | Nov 2011
- Baytex: 10 sections | Kaybob, Pine Creek | Nov 2011
- Vero: 50 net sections | Edson and Kaybob | Jan 2012
- Angle/Crew: 10 net sections (6240 net acres) | Ferrier (Pembina) | Feb 2012
- Online: 90 net sections | Edson | Feb 2012
- Sonde: 38 net sections (24,383 net acres) | Kaybob | Feb 2012
- Terra: 85 net prospective sections | Karr/Ante Creek (north of Kaybob) | Feb 2012

* Operators whose land positions are outside the study areas

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- The top half of the table lists all operators with Duvernay well licenses or drills in the study areas of Kaybob, Pembina and Edson.
- Other operators who have publically expressed interest in the play have also been listed, together with the strike areas in which their acreage is found.
- Here we see that overall Encana, Celtic, Husky, Athabasca Oil Sands, Chevron and Talisman have been the most active to date.
- Encana, Talisman and Yoho are active in both the Kaybob and Pembina areas.
- A&D activity is increasing in the areas with 12 recent publically announced processes that involve Duvernay PNG rights. Many of these are underway with bid dates in February.
- Most of the players, especially with extensive lands exposed to the play, hold their positions under broker names, making it problematic to show their holdings geographically for now.
- At Kaybob and Pembina, Duvernay PNG rights are tightly held, and acquisition, joint venture or merger are the best ways for new entrants to gain exposure to the play.
- Sandwiched between these is Edson, where larger blocks of Open Crown are still available for lease.
- We would expect to see the continued opportunity for consolidation in the Pembina and Kaybob areas. Which begs the question: at an estimated $10-12MM per well, how much Duvernay is enough?
What to Watch for

At Kaybob

- At Kaybob it will be a year of data as the first wells drilled have their data enter the public domain. This will help to establish both liquid content and deliverability

- In particular both Taqa and Husky have wells that are due to come off confidential status in April. These vertical wells are 03/16-25-061-19W5 (Taqa) and 03/08-25-060-18W5 (Husky). Further, Athabasca’s well at 01-24-061-23W5, which is shown to be in the oil window, comes off confidential in December. Other wells will come off confidential between June and December, all of which are posting within the liquids-rich gas fairway

- Expect that this will be the year of consolidation – watch to see what happens to Birchcliff’s 195 net sections of land, some of which lands in the Kaybob area, as they move through their Strategic Alternatives process. Recall that at Kaybob Sonde recently announced a completed disposition of 38 net sections

- As players determine that their land positions are secure and complete, land positions will be disclosed

At Edson

- Angle’s well will be released from confidential status in August

- Any postings at Crown Land sales, since much of the fairway is open in the Duvernay

At Pembina

- ConocoPhillips was the first to drill the Duvernay at Pembina, and their wells will be the first to come off confidential in September

- Watch the licensing at Pembina, as most of the large Crown leases that sold in 2011 were under broker names, so the true operators in that area are largely hidden

- The true operator of the broker well (Antelope 10-17-045-06W5) will be revealed in October, when the well comes off confidential

- Disclosure of the new JV partner that Mako/Woma/Warren found in their process, as they’re committed to drill a Duvernay vertical well in 2012

About the Reservoir

- Confirmation of liquid content - both NGLs and free condensate

- Define boundaries around the wet gas fairway

- Confirmation of deliverability, EUR and pressure regime

- Initial indications of completion technique including horizontal length, frac density and carrier fluid
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