#### GLOBAL BANKING AND MARKETS



#### **Scotia Waterous**

TECHNICAL PIONEER AND GLOBAL LEADER IN OIL AND GAS M&A



When **insight** *matters*.<sup>™</sup>

January 2014

PRIVATE AND CONFIDENTIAL

### US Shale Oil Growth and Profitability Study

### The Study Focused on the Following Questions:

- Are shale oil developments in the US profitable?
- Can major new entries still be made that are economic?
- Are the major US shale oil basins mature or still growing in scope and optimization opportunity?

### Four of the premier shale oil basins were studied:

- Williston Bakken formation as the primary development interval
- Gulf Coast Eagle Ford formation as the primary development interval
- DJ Wattenberg Niobrara formation as the primary development interval
- Permian Wolfcamp formation as the primary development interval

### **Observations Common to all Four Basins:**

- They are highly profitable starting from the development phase and moving forward
- They continue to grow in the number of pay intervals in the vertical section and modify aerial extent.
- They continue to show improving development metrics: downspacing, IPs & EURs, capital costs, operating expense, and mid stream capacity
- They economically support new entry acquisition costs at current transaction mulitples.

### Continued Asset Improvement & Geologic Upside

### All Four Basins Show Improving Performance

- Rates: Increasing
- EURs: Increasing
- Costs: Decreasing for wells and completions
- Time from spud to first oil is decreasing
- Midstream capacity & regional export is increasing

### All Four Basins Continue to Develop Additional and New Geologic Zones

- Vertical extensions to the original interval (additional benches for example)
- Additional / new geologic intervals are producing at economic rates (other than the main basin reservoir)
- Arial modification of the primary zone of interest (Williston: Bakken, DJ Wattenberg: Niobrara, etc)

# Eagle Ford: More Intervals, Tighter Spacing & Improved Rates/EURs

The Gulf Coast continues to grow in the number of pay intervals in the vertical section, adding inventory through downspacing and increased aerial extent.

- Vertical extensions to the original interval (Upper and Lower Eagle Ford)
- Additional / new geologic intervals are producing at economic rates (other than the main Lower Eagle Ford reservoir)
- Improving development metrics: downspacing, IPs & EURs, capital costs, operating expense, and mid stream capacity
  - Target interval and completion optimization have outrun potential performance degradation due to downspacing
- Extending the play aerially to the northeast



#### **ESCONDIDO** OLMOS SAN MIGUEL GULFIAN AUSTIN CHALK CRETACEOUS **UPPER EAGLE FORD** LOWER EAGLE FORD BUDA COMANCHEAN DEL RIO GEORGETOWN **EDWARDS** STUART CITY GLEN ROSE PEARSALL SLIGO

### Increased Density from 4 to 32 wells per 640 DSU



### Gulf Coast / Eagle Ford Stratigraphic Column

### Bakken: More Intervals, Tighter Spacing & Improved Rates/EURs

- CLR producing first multi-interval bench development. Average 1,480 BOEPD from MB & TF1. Average 1,070 BOEPD from TF2 & TF3
- EOG routinely completing MB wells over 2,000 BOPD. Extending these results to the TF1
- Operators such as Whiting are testing the MB up to eight laterals and the Pronghorn up to four laterals per 1,280 acre DSU
- Oasis, Whiting, and Statoil are reporting strong middle Bakken well results in eastern Montana's Roosevelt County, pushing the play further to the West

Williston / Bakken: Continental Resources





#### Williston / Bakken: From 1 to 14 wells per 1280 DSU



### Wattenberg: More Intervals, Tighter Spacing & Improved Rates/EURs

Noble Energy Leading Development

- 9,000 laterals, 750M EUR, 188% BT ROR are being achieved in the main Niabrara B bench
- Play is extending in to northern Colorado's East Pony area
- Full development for the Codell sandstone and emerging development plans for the Greenhorn lime stone.
- Bonanza Creek and PDC are following Noble's lead in high density well count, extending the vertical opportunity, and improving well results.





### DJ Basin Wattenberg: From 4 to 30 wells per DSU



### Wolfcamp: More Intervals, Tighter Spacing & Improved Rates/EURs

**Pioneer Resources Leading Development** 

- 24 hr IP of 3,176 BOEP (83% OIL), 9,542' lateral length. Well performance approaching EF status
- Down spacing pilots to 50 acre equivalent
- Wolfcamp D: recent well University 7-43 10H in Andrews county extended the play 60 miles to the west (24-hr IP: 3,605 BOEPD 7,382' lateral length).
- Approach has extended the B and C benches south in to Crocket county, Highmount even further south in to Sutton county.

Permian / Wolfcamp: Approach Resources



### Permian Wolfcamp: From 14 to 35 wells per DSU



### Hypothetical Models Were Constructed to Study the Cost of Entry for the Following:

- Eagle Ford
- DJ Wattenberg
- Bakken

The hypothetical models were built using core area type curves and top quartile operating performance (capex, opex, etc.). Spacing, drill times, well count, and acreage were set to such that a equivalent comparisons could be made. The concept is to compare the years needed to attain free cash flow if 30% of the PV10 were used as an acquisition cost.

### **Three Transactions and One Start Up were Modeled**

- Eagle Ford Marathon Oil Company
- Bakken Statoil
- Permian Wolfcamp Approach Resources
- DJ Wattenberg Bonanza Creek Energy Inc.

The transactions were modeled such that cost of purchase and associated future development was forecast to determine the timing of free cash flow and other key economic and production metrics. Data was obtained from public sources including investor relations slides.

### Material New Entries Can Attain Free Cash Flow in Six Years

Assuming an entry fee of totaling 30% of the PV10, Free cash flow can be attained in six to eight years with an eight rig program

#### Years to Reach Free Cash Flow

	Bakken									
	Entry Fee (as a % of PV-10)									
	<u>15%</u>	<u>20%</u>	<u>30%</u>	<u>50%</u>	<u>70%</u>	<u>80%</u>	<u>100%</u>	<u>120%</u>		
	\$1.33 B	\$1.77 B	\$2.65 B	\$4.42 B	\$6.18 B	\$7.07 B	\$8.83 B	\$10.6 B		
2 Rigs	12	15	24	NA	NA	NA	NA	NA		
4 Rigs	8	9	12	19	NA	NA	NA	NA		
6 Rigs	7	8	9	13	17	23	NA	NA		
8 Rigs	6	7	8	11	13	16	NA	NA		
10 Rigs	6	6	7	9	11	13	20	NA		
12 Rigs	6	6	7	8	10	11	17	NA		
14 Rigs	5	6	6	7	9	10	15	NA		
16 Rigs	5	5	6	7	9	10	13	25		

	Eagle Ford								
	Entry Fee (as a % of PV-10)								
	<u>15%</u>	<u>20%</u>	<u>30%</u>	<u>50%</u>	<u>70%</u>	<u>80%</u>	<u>100%</u>	<u>120%</u>	
	\$2,033,731	\$2,711,642	\$4,067,463	\$6,779,104	\$9,490,746	\$10,846,567	\$13,558,209	\$16,269,851	
2 Rigs	9	12	21	NA	NA	NA	NA	NA	
4 Rigs	6	7	9	16	NA	NA	NA	NA	
6 Rigs	4	5	7	10	15	20	NA	NA	
8 Rigs	4	4	6	8	11	13	NA	NA	
10 Rigs	3	4	5	7	9	10	18	NA	
12 Rigs	3	4	4	6	7	9	13	NA	
14 Rigs	3	3	4	5	7	8	11	NA	
16 Rigs	3	3	4	5	6	7	10	24	

	DJ Basin									
				Entry	Fee (as a % of F	-V-10)				
	<u>5%</u>	<u>10%</u>	<u>15%</u>	<u>20%</u>	<u>25%</u>	<u>30%</u>	<u>40%</u>	<u>50%</u>		
	\$215,989	\$431,978	\$647,968	\$863,957	\$1,079,946	\$1,295,935	\$1,727,914	\$2,159,892		
2 Rigs	8	8	9	9	10	11	12	14		
4 Rigs	7	7	8	8	9	10	10	11		
6 Rigs	7	7	7	7	8	8	8	9		
8 Rigs	6	6	6	6	7	7	7	8		
10 Rigs	5	5	6	6	6	6	7	7		
12 Rigs	5	5	5	5	6	6	6	7		
14 Rigs	5	5	5	5	5	5	6	7		
16 Rigs	4	5	5	5	5	5	6	7		

### Model Inputs: 1000 Wells

- Entry fee as a percentage of PV10
- 1000 well locations
- One well drilled per month
- Costs and type curves from best operators
- Opex from best operators
- Basin spacing practices

### Eagle Ford, Bakken, & DJ Models



### Marathon Acquires Hilcorp Resources Holding in the Eagle Ford Shale

Deal was accretive to Marathon's existing position in the Eagle Ford Shale.

Marathon paid \$3.5 billion or approximately \$25,000 per acre, to enter the play at essentially the peak of acreage acquisition when 'sweet spots' had clearly been defined.

EDWARDS Transaction Close Date: VAL VERDE KENDALL COMAL REAL CALDWELL 2011-11-01 BANDERA COLORADO GUADALUPE Effective date of May FORT BEN **TEXAS** 1,2011 UVALDE MEDINA ONNEY WHARTON 141,000 net acres for \$3.5B • 90% Operated 74VAL MAVERICH 65% Avg WI 37 producing wells, 7,000 **MEXICO** LIVE OAL LA SALLE MC MULLEN net boe/d Gulf of Mexico Effective date of May 1, SAN PATRIC Marathon Acreage 2011 **Hilcorp Acquisition** IM WELLS OIL WINDOW MAPPED OIL/GAS CONDENSATE WINDOW DRY GAS KLEBERG

# Development Plan Assumptions

The development plan assumed three distinct areas: Condensate, Volatile Oil, and Black Oil.

Marathon's existing acreage is not included in the development model and DCF, but consideration is given to their existing rig counts and operations in the area.

Boe/d (Oil + Wet Gas)

200

0 + 0

10

Condensate

A.r.o.2		Condoncato	Plack Oil
Area	volatile Oli	Condensate	DIACK OII
Gross Ac (000)	102	56	26
Net Ac (000)	51	41	23
Avg WI	50%	73%	88%
Royalty	25%	25%	25%
NRI	38%	55%	66%
Rigs	4	6	2
Aggressive Spacing (ac)	40	40	80
Conservative Spacing (ac)	80	80	160
Acreage Attrition	10%	10%	10%
Gross Wells (aggressive)*	2295	1260	293
Gross Wells (conservative)	1148	630	147
Well Cost (\$MM)	7.9	7.9	7.9
Fixed Opex (\$/well/mo)	850	850	850
Var Opex Oil (\$/bbl)	8.2	8.2	8.2
Var Opex Gas (\$/mcf)	0.77	0.77	0.77
Oil Price Deduct (\$/bbl)	\$ (1.50)	\$ (1.50)	\$ (1.50)
Gas Price Deduct (\$/mcf)	\$ (0.25)	\$ (0.25)	\$ (0.25)
Drilling Cycle Time (S-S d)	25	25	25

**Development Plan Assumptions** 

\*At the time of the acquisition the Eagle Ford was not being drilled as densely as it is now, and the conservative well space was likely assumed. Current down spacing assumption are included in the aggressive well count

1200 Area Volatile Oil Condensate **Black Oil** 350 bbl/day IP 650 bbl/day 1,200 bbl/day 1000 Dei 80% 85% 79% b-factor 1.25 1.25 1.40 Df 6% 6% 6% Initial GOR 200 scf/bbl 650 scf/bbl 1,000 scf/bbl 800 EUR 530 Mboe 760 Mboe 333 Mboe 600 400

**Type Curve Parameters** 

### GLOBAL BANKING AND MARKETS

20

30

Months on Production

Volatile Oil

🕤 Scotiabank

60

50

Black Oil

40

### Economics of Transaction and Associated Future Development



### Statoil Acquires Brigham Exploration – Enters Williston Basin

Statoil adds to existing Onshore US position through the acquisition of Brigham Exploration. The transaction immediately adds production growth and reserve additions and makes Statoil a leading operator in the Bakken.

**Transaction Highlights** 

- All cash offer of 4.7 Billion
  - Estimated Price paid for the Bakken^ 4.47 Billion
  - Close Date: Dec 8, 2011
  - Effective date of Dec 1, 2011\*
- At the time of the transaction Brigham had approximately 17,000 boe/d of net production and net proved reserves of 67 MMboe
- Acreage Position^
  - 40,000 net acres in Texas & Oklahoma^
  - 600,000 gross / 375,000 net acres in the Bakken
    - 60% de-risked
    - 300-500 MMboe risked resource base
  - Gross unrisked recoverable resource 1,980 MMboe
- Brigham was among the top 15 lease holders in the basin and top 10 most active drillers in the basin at the time of the transaction

\*Effective date used for DCF model on subsequent pages. ^40,000 net acres outside of the Williston Basin was not included in this analysis

#### **Brigham Exploration - Williston Basin**



# Pace of Development: Rig Count Drives Wells Drilled and Economics

- Statoil is developing in six core operating areas
- Statoil's average NWI across the play is 60% and they operate 90% of their total acreage
- The operated rig count dropped from 15 10 in 2013, but is expected to ramp back up by 2017



#### Reservoir Prospective **Gross Acres Total Net** Gross Net Area Net Acres Wells Wells Bakken 4,900 8.167 30 Par/Aus/San Three Forks 2.450 4.083 15 104 33,500 55,833 Bakken East MT Three Forks 33,500 55,833 104 85,600 142,667 267 Bakken Other MT 142,667 Three Forks 85,600 267 Bakken 161,600 538,667 505 1,683 **Rough Rider** Three Forks 161,600 538,667 505 1,683 35,200 58,667 110 Bakken **Ross Unit**

35,200

30,100

30.100

Three Forks

Bakken

Three Forks

Mercer

**Prospective Acreage** 

#### Pace of Development

58,667

50.167

50.167



**Scotiabank** 

50

25

173

173

445

445

183

183

157

157

110

94

94

# Development Plan Assumptions: Optimistic Outside of Core Areas

- The Williston Basin is being developed almost exclusively with horizontal wells
- Statoil is developing the majority of there acreage on 1,280 acre units with 10,000 ft lateral wells
  - Currently 4 Bakken and 4 Three Forks wells are planned for each drilling unit
  - Well spacing is approximately 320 acres in each producing reservoir



#### **Type Curve Parameters**

Operating Area	Reservoir	Туре	Oil IP	B Factor	Initial	GOR	WOR	EUR
		Curve	(bbls/d)		Decline (%)	(scf/bbl)	(bbl/bbl)	(Mboe)
Ross Unit		TC-1	975	1.8	83.6	818	0.71	593
Rough Rider (Williams County)	Bakken	TC-2	875	1.55	81.3	860	0.969	558
Rough Rider (McKenzie County)		TC-3	900	1.8	81.9	989	0.96	619
East MT		TC 4	E00	1	70.6	607	1 5 2	204
Other MT		10-4	590	1	79.0	097	1.55	294
Par/Aus/San		TC-5	800	1.8	71.0	2340	0.6	1,054
Mercer		TC-6	600	1.8	75.1	1024	1.28	441
Par/Aus/San								
East MT								
Other MT								
Rough Rider (Williams County)	Three Forks	TC-7	600	1.8	75.1	1024	1.28	441
Rough Rider (McKenzie County)								
Ross Unit		TC-8	700	1.2	83.1	2518	1.281	469
Mercer		TC-9	590	1	79.6	697	1.53	294

### Model Inputs

Economic Input Assumptions							
		\$1,667	per well/mo				
Operatin	g Cost	\$1.09	perMCF				
		\$6.55	per bbl				
Pricing Dif	forential	\$9.98	per bbl				
T hong bi	lerential	\$0.35	per MCF				
Ad Val	Tax	0.00%					
		60.00%	WI				
Owner	ship	49.20%	NRI				
		18.00%	Roy				
Sevi	Fax	\$0.1476	per MCF				
000	lax	11.50%	Oil				
Cap	ex	\$8.95	MM/well				
Pricing	2012	2013	2014+				
Oil (\$/bbl)	94.05	95.70	100.00				
Gas (\$/Mcf)	Gas (\$/Mcf) 2.75		4.00				
NGL (\$/bbl)	NGL (\$/bbl) 28.22		30.00				

### Economics of Transaction and Associated Future Development



# Bonanza Creek Energy: Successful Fast Follower in the Wattenberg

Bonanza Creek Energy Inc. with a group lead by West Face Capital Inc. formed a new E&P company, monetizing the predecessor (Bonanza Creek Energy Company, LLC) and additionally acquiring Mid-Continent and Rocky Mountain Assets from Holmes Eastern Company.

### **Transaction Highlights**

- Close Date: Dec 23, 2010
  - Effective date of Dec 1, 2010\*
- At the time of the transaction BCE1 had approximately 4,100 boe/d of production and proved reserves 30MMboe



^6,000 acres in the San Joaquin Basin of California was also acquired and subsequently divested and is not included in this analysis.

### Wattenberg Field

- This area represents the core of BCEI's acreage and the focus of development since 2012
- BCEI's acreage position is in what is considered the extension area of the Wattenberg field, adjacent to the core operations of Noble, PDC and Anadarko.



# Following Front Runner Noble, BCEI is Improving in All Key Metrics

### BCEI has shifted it's drilling focus to almost exclusively Wattenberg Hz Oil Development

#### **Development Plan Assumptions**

- BCEI has drilled a combination of vertical and horizontal wells into the Niobrara and Codell formations, beginning in 2011 the HZ activity began to ramp up
- 2013 and forward development is assumed to be exclusively horizontal drilling.
- The primary zones of interest are the Niobrara B, C and the Codell
  - BCEI is currently evaluating additional benches for prospectively
- This field is currently being developed with 4,000' laterals on 80 ac spacing in Nio B and C benches and at 160 ac spacing in the Codell
  - 40 ac downspacing and extended reach laterals (9,000') are currently being evaluated by BCEI (Noble is doing this routinely) at this time are still in the early stages of being evaluated.
  - Offset operators such as Noble are currently downspacing to a minimum of 16 wells at 40 acres and evaluating higher densities of over 30 wells per section including additional Niobrara benches.
  - Noble is routinely drilling 9,000' laterals.



**Type Curve Parameters** 

### Model Inputs

# Economic Input Assumptions \$250 per w ell/mo 93.00% WI

		φ230	230 per weil/mo				93.0	0 /0	VVI		
Operating Cost		\$1.05	per MCF per bbl		Ownership		76.26%		NRI		
		\$6.55					18.00%		Roy		
Pricing Basis		\$5.75	per bbl		Sev Tax		5.00%		Gas/NGL		
Fricing Dasis		\$0.37	per MCF		Geviax		5.00%		Oil		
Ad Val Tax		7.60%			Capex		\$4.6	65	MM / v	v ell	
Pricing		ricina	2011		2012	20	)13	20	14+		
	Oil (\$/bbl)		94.88		94.05	9	5.70	10	0.00		
Ga		s (\$/Mcf)	4.00		2.75		3.73		4.00		

28.22

28.71

30.00

### 🝯 Scotiabank

28.46

NGL (\$/bbl)

### Development Plan: Future Plans will Improve Production & Economics

- The BCEI valuation was conducted using two endpoints to capture a reasonable range of values
- In both cases no additional development was assumed in the North Park basin
- In the Mid Continent it was assumed that the remaining acreage was drilled up to 10 ac spacing.\*

**Initial Drilling Plan** 

- Additional upside beyond these scenarios is present in the following:
  - Additional Wattenberg benches: Niobrara A, Wattenberg Greenhorn & extended reach laterals
  - Cotton Valley 5 ac spacing
  - Arkansas Brown Dense
  - North Park Basin Niobrara



- Assumptions 2013 forward drilling plan:
  - Nio B 80 ac spacing 318 wells
  - Nio C 80 ac spacing 229 wells
  - Codell 160 ac spacing 44 wells
  - Cotton Valley 10 ac spacing 144 wells

\*Mid Continent development taken from Wood Mackenzie

### Future/Upside Drilling Plan



- Assumptions 2013 forward drilling plan:
  - Nio B 40 ac spacing 554 wells
  - Nio C 40 ac spacing 650 wells
  - Codell 80 ac spacing 182 wells
  - Cotton Valley 10 ac spacing 144 wells

# Thitial Drilling Plan Results from Company Formation Forwards



### Tuture Drilling Plans with Assumed Purchase Model



### Approach Resources: A Pure Midland Basin Wolfcamp Play

Since 2009, Approach has increased its Wolfcamp reserves seven times by successfully completing a Wolfcamp pilot program and then extrapolating it to a larger-scale development.

#### **Asset Overview**

- 152,000 total net acres in the basin
- Q3 2013 net production of 8.8 Mboe/d
- 95.5 MMboe proved reserves at yearend 2012 (69% liquids)
- 2013 capital budget of \$260 MM, of which 90% is allocated to Hz Wolfcamp
  - o Plan to drill ~40-42 Hz wells with 3 rigs
  - Testing "stacked-wellbore" development and optimizing well spacing and completion design
- 2,000+ locations in Wolfcamp A, B & C
  - Well costs average \$5.5 MM for lateral length of ~7,000'
  - o Average EUR (gross) of 450 Mboe
  - ~80% of EUR made up of oil and NGLs
- Gross potential resource of 943 MMboe split evenly amongst the three Wolfcamp benches
- Additional upside potential in the Wolfcamp D



Source: Approach Resources Investor Presentation August 2013



# Development Plan Assumptions

Approach has been testing the upper three benches of the Wolfcamp on their acreage with very encouraging results.

- ~2000 A,B & C locations are contemplated in this development
- Drill times are averaging 12 days for 2013 however pad drilling hasn't been implemented to date, it is included going forward.
- Current estimates are that the Wolfcamp D is prospective on about 50% of their acreage, 350 locations were included in the development plan.

### **Model Inputs**

Economic Input Assumptions							
Operati	ng Cost	\$7.00	per bbl				
Pricing D	ifferential	\$4.00	per bbl				
Theng D	merential	\$0.35	per MCF				
Ad Va	l Tax	4.00%					
		98.00%	WI				
Owne	rship	73.50%	NRI				
		25.00%	Roy				
Sou	Тах	7.50%	Gas				
Sev	Tax	4.60%	Oil				
Ca	pex	\$5.50	MM/well				
Pricing	2012	2013	2014+				
Oil (\$/bbl)	94.05	95.70	100.00				
Gas (\$/Mcf)	Gas (\$/Mcf) 2.75		4.00				
NGL (\$/bbl)	28.22	28.71	30.00				



### Pace of Development



# Results of Assumed Development Plan

