Evolution and Development of the WolfBone Play, Southern Delaware Basin, West Texas: An Emerging Frontier, An Oil-Rich Unconventional Resource*

Bill Fairhurst[1] and Mary Lisbeth Hanson[1]

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Posted June 18, 2012

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Please refer to a closely companion article, entitled "WolfBone Play Evolution, Southern Delaware Basin: Geologic Concept Modifications That Have Enhanced Economic Success," Search and Discovery Article #10412 (2012).

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Abstract

The WolfBone play is an emerging unconventional oil-resource in the southern Delaware Basin. Exploration and development has been a systematic, progressive evolution from geologic concept to drilling, production, evaluation and revision of targets. Originally exploration focused on Wolfcamp sandstone reservoirs below and Third Bone Springs sandstone reservoirs above to current focus on the 1000-ft-thick, oil-rich, unconventional Wolfcamp shale.

The Wolfcamp is an ideal heterogenetic resource consisting of quartz, carbonate and kerogen. Exploration and field development will be successful over a large area. However, the geologic and economic sweet spot is limited to the proximal basin floor on the gently dipping western flank. In this setting quartz and kerogen accumulated in the quiet deep basin interrupted by episodic deposition of shelf to basin-floor carbonate debris flows that settled at the de-acceleration boundary between the slope and basin floor. These depositional processes resulted in compositional and grain-size heterogeneities and accumulation of the thick organic-rich, technically and economically exploitable targets.

During maturation large volumes of oil were sealed in-place (108 MMBOIP per section). Expansion from kerogen to oil in a sealed system resulted in overpressure. Individual wells have flowed 45 MBO from 11,000 ft prior to initiating artificial lift; atypical of Permian Basin reservoirs. Farther into the basin and upslope these conditions do not exist and are outside the economic sweet spot. Basinward the unit is consistently thick; however, there is more shale, and it is starved of siltstones and carbonates. Upslope the unit thins and is gas-prone; the mixture of coarser-grained shelf carbonates and sandstones provided migration pathways breaching the closed system, limiting productivity and ultimate economic recoveries.

Since 2009, this play has been developed with vertical wells comingling the oil-resource with conventional reservoirs. Interpretation of imaging logs has identified the primary fracture orientation and zones with conjugate fractures systems. Integration with production logs has optimized horizontal target identification, and horizontal drilling has begun. The Avalon, being exploited in New Mexico, is also present. The Avalon sweet spots occur at similar depositional setting as the Wolfcampian resource and the same geographic position in this portion of the basin. The Avalon is estimated to have 103 MMBOIP per section.

References

Fitchen, W.M., 1997,Carbonate sequence stratigraphy and its application to hydrocarbon exploration and reservoir development, *in* I. Palaz, and K.J. Marfurt (eds.), Carbonate Seismology: SEG Geophysical Development Series, no. 6, p. 121-178.

Wright, W.F., 1962, Abo reef: prime West Texas target, Parts 1 and 2: Oil and Gas Journal, Part 1, v. 60/31, p. 226-235, Part 2, v. 60/32, p. 188-194.

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WolfBone Play
Southern Delaware
Permian Basin

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Fairhurst, Bill and Hanson, Mary Lisbeth, 2012, Evolution and Development of the WolfBone Play, Southern Delaware Bain, West Texas: An Emerging Frontier, An Oil Rich Unconvential Resources.

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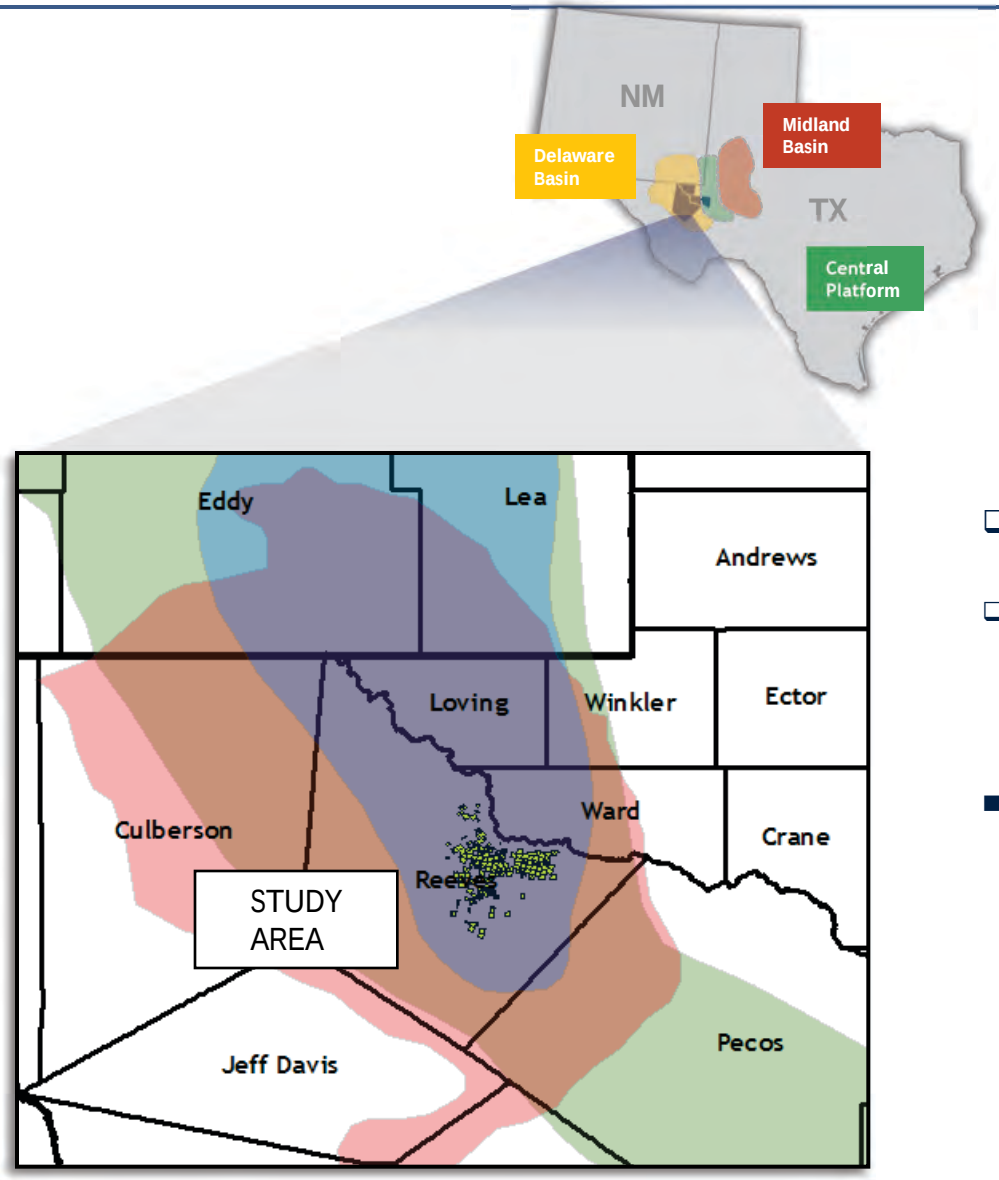
Overview - Location



- Most active US basin with 433 rigs (Delaware Basin: 214), Hz Rigs: ~35%(1)
- *Total Resource in place per section: 108 Mmboe*
  - *Horizontal Development:*
    - *Alternative Wolfcamp development strategy modeled*
    - *3rd Bone Spring development*
- ***Upside Potential***
  - Horizontal resource in Avalon Shale
    - Avalon Shale - 105 MMboe in place per section
  - Delaware Sands – ongoing vertical & horizontal exploitation
  - Vertical drilling targeting deeper gas zones

(1) Source: RigData, TPH. Hz % includes horizontal and directional rigs. As of September 30, 2011 or most recent data available.

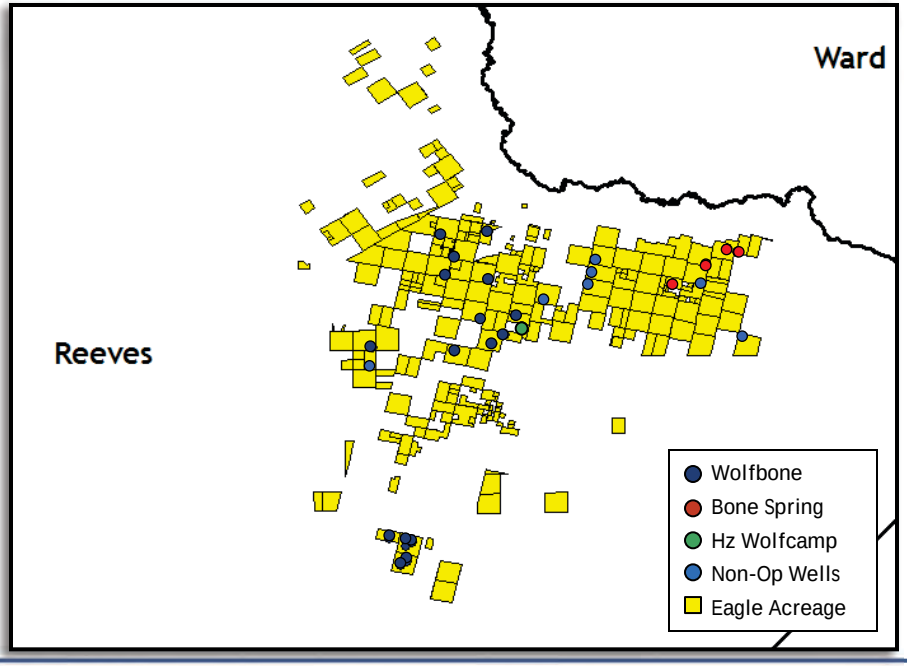
The Permian is the Premier US Oil Basin

Multi-Zone Vertical and Hz Development Potential

- *Wolfbone*
  - *Commingled vertical* wells that capture oil-rich 3rd Bone Spring and Wolfcamp over a *1,250' interval*
  - *Overpressured analog* to Wolfberry in the Midland Basin
  - *High-liquid content* provides superior economics
  - 108 MMboe in-place per square mile
- *Wolfcamp*
  - Horizontal drilling has begun in TX and Eddy, NM
  - Thick interval provides multi-lateral potential
- *3rd Bone Spring*
  - Substantial nearby horizontal drilling
- *Avalon Shale*
  - Up to 1,000' gross thickness across the basin
  - Laterally extensive & continuous across Reeves, Co.
  - 105 MMboe in-place per square mile
- *Delaware Sands (Brushy, Cherry, and Bell Canyon)*
  - Vertical & horizontal exploitation of the 3,000 - 3,500' thick interval with dozens of potential pays

Eagle Development is Proving Many Zones

- Eagle currently produces 1,888 boe/d from 28 wells
  - 24 vertical wells commingling production across 3rd Bone Spring members and Upper Wolfcamp members
  - 4 horizontal wells drilled into the 3rd Bone Spring Sands
- Eagle is currently drilling their first horizontal Wolfcamp well in the Upper Wolfcamp Shale B member
  - Excellent results to date with >100' flares during drilling with 12.6 ppg mud
  - Over 100 bbl oil returned to pit while drilling lateral

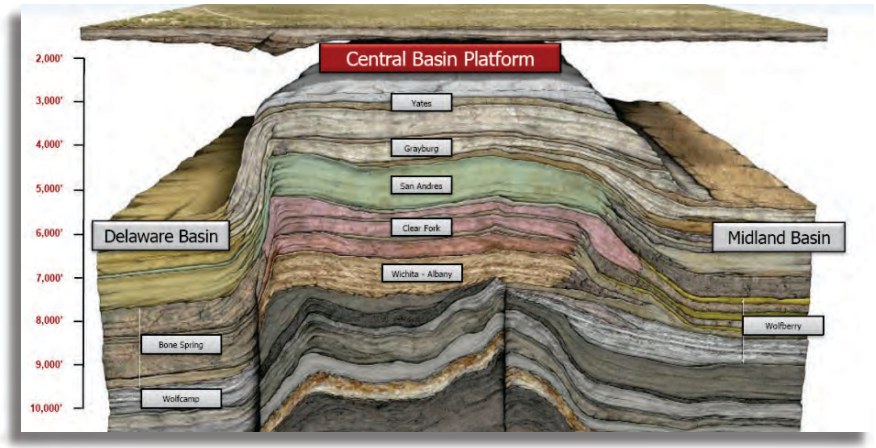


Production from the Permian System

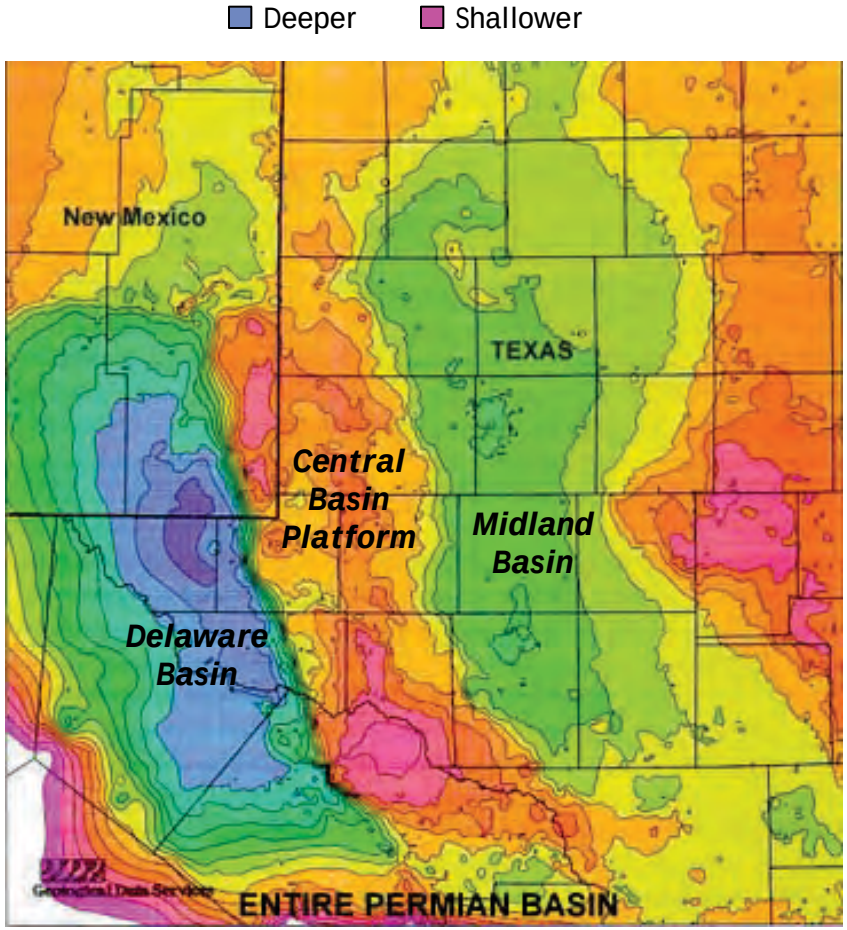
Summary

- Permian system comprised of multiple basins:
  - Delaware Basin
  - Central Basin Platform
  - Midland Basin
- Development progression:
  - Early production from shallow formations on the basin edges
  - *Transition to deeper deposits in the central Delaware (Avalon, Bone Spring, & Wolfcamp)*
- Recent basin revitalization:
  - *Comingled vertical completions*
  - Modern horizontal drilling and completion technologies

Permian Basin Cross Section



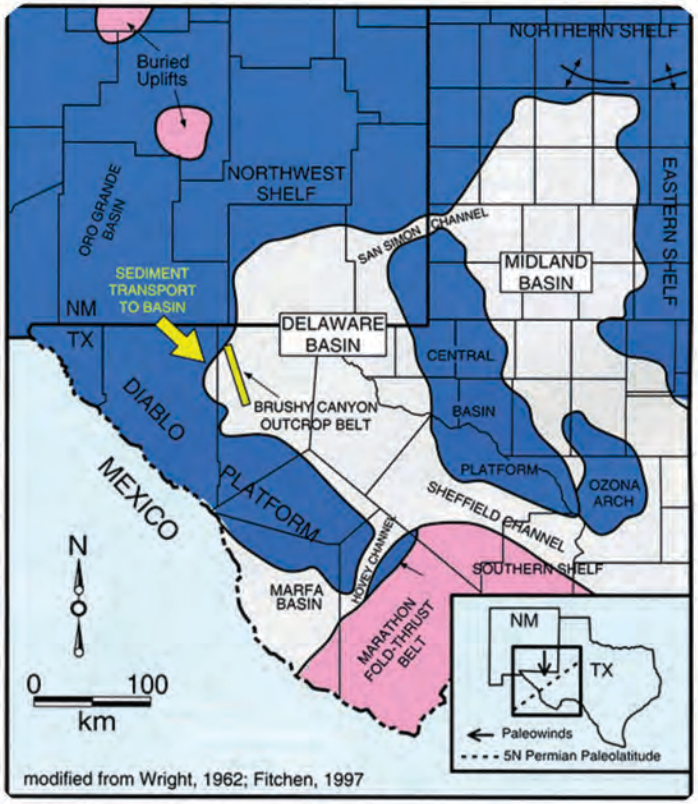
Permian Basin Structure

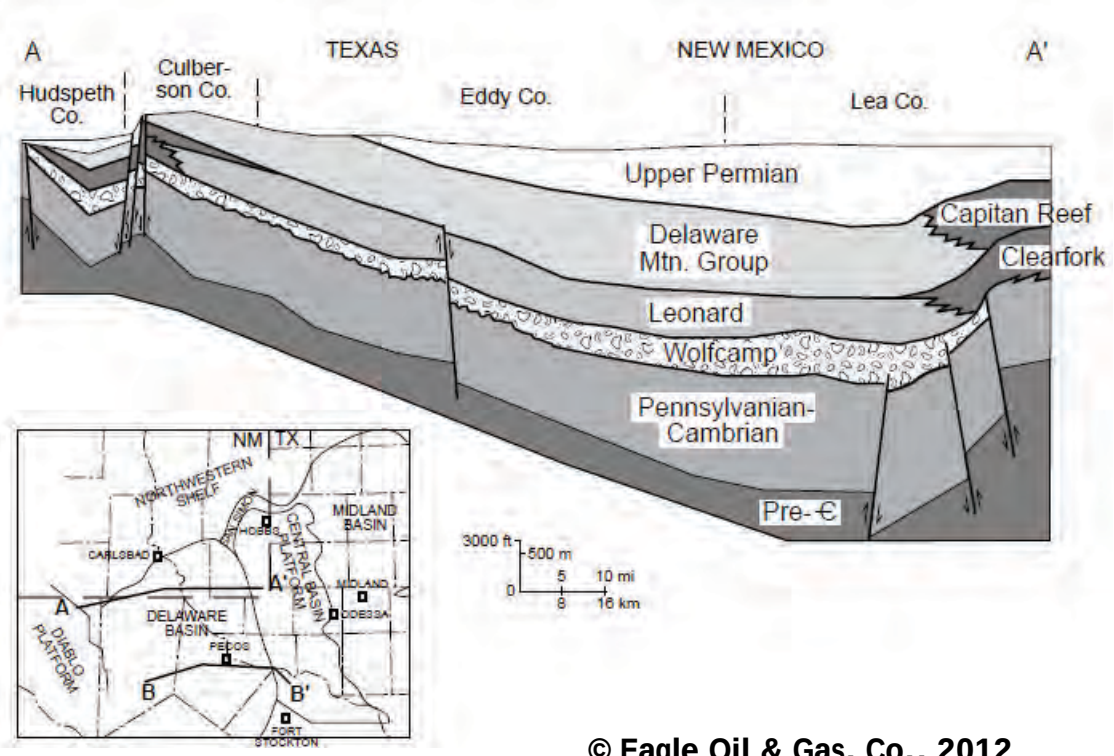


Source: Center for Energy & Economic Diversification UTPB, Geology of National Parks, National Park Service US Dept of the Interior, Society for Sedimentary Geology, Sandridge IR presentation.

Delaware Basin Deposition

- 2 depositional systems in place
  - Deep submarine channels running off the NW Shelf and Central Basin Platform
  - Periods of influx of carbonate debris
- 3rd process in generation of organics in the photic zone across the entire basin as debris settled
  - Mostly organics settling in the deep basin; carbonates mainly deposited on the Shelf and on the Slope





Source: Center for Energy & Economic Diversification UTPB, Geology of National Parks, National Park Service US Dept of the Interior, Society for Sedimentary Geology.

Recent Nearby Industry Results

Avalon Shale
Chesapeake
Ross Ranch Federal 6-1H
IP rate: 1,528 boe/d

Avalon Shale
Apache
Bullhead 55-1-41 1H
IP rate: 835 boe/d

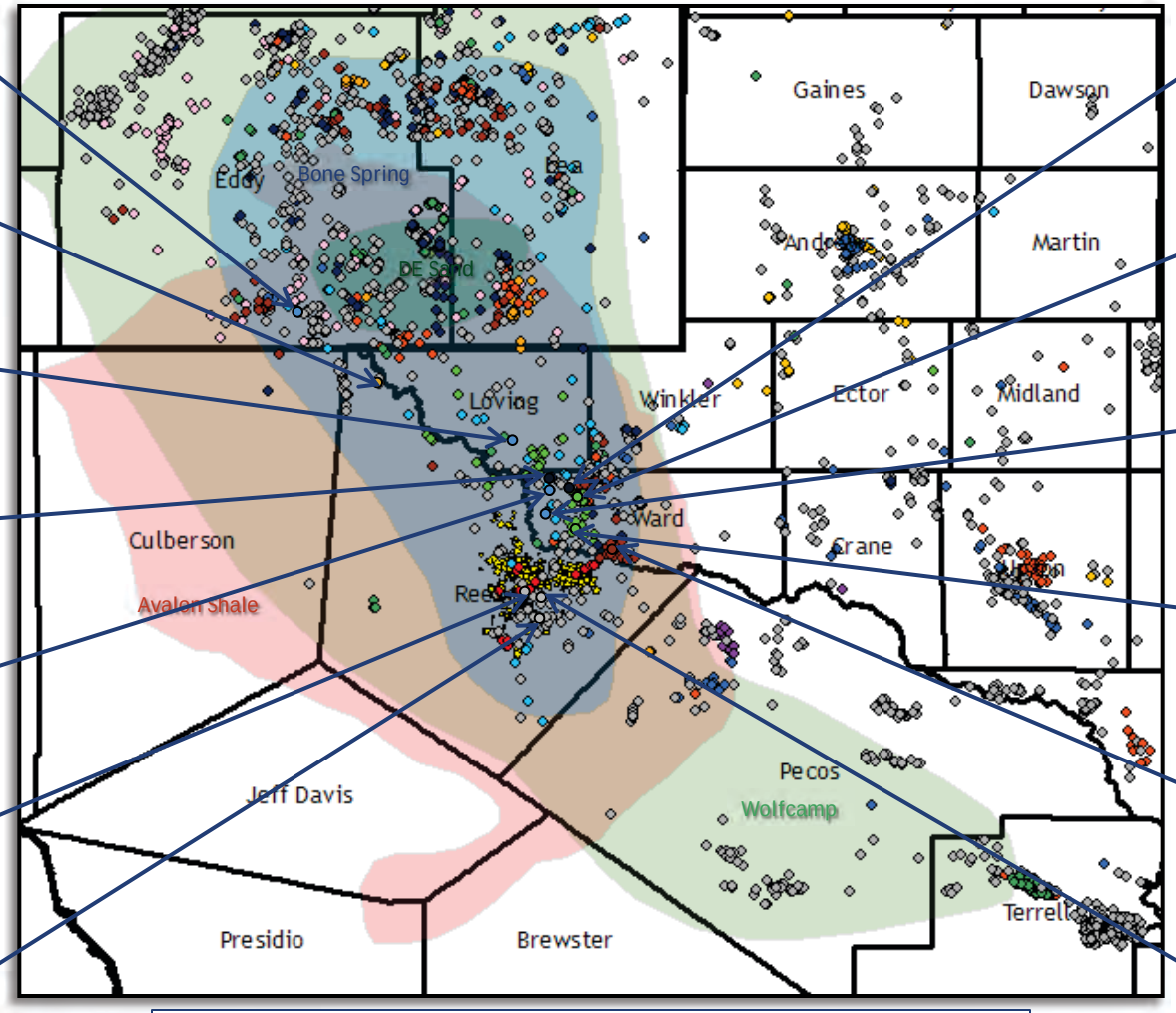
Bone Spring
Chesapeake
Johnson 1-86
30-day rate: 920 boe/d

Bone Spring
Devon
Talladega 65 1H
30-day rate: 1,281

Bone Spring
Chesapeake
Monroe 1-17
30-day rate: 1,614 boe/d

Wolfbone
J. Cleo Thompson
Perry State 204
30 day rate: 549 boe/d

Wolfbone
J. Cleo Thompson
Terrill State
30-day rate: 313 boe/d



Delaware
Devon
Colonel Drake 24 1H
30-day rate: 518 boe/d

Bone Spring
Anadarko
Monroe 34-220
30-day rate: 1,345 boe/d

Bone Spring
Chesapeake
Crockett 1-26 1H
30-day rate: 1,383 boe/d

Bone Spring
Anadarko
Blacktip Johnson 1-39H
30-day rate: 1,364 boe/d

Bone Spring
Cimarex
KHC '33-26'
30-day rate: 1,226

Wolfbone
J. Cleo Thompson
Perry State 40
30 day rate: 708 boe/d

Source: HPDI, Corporate IR Presentations.

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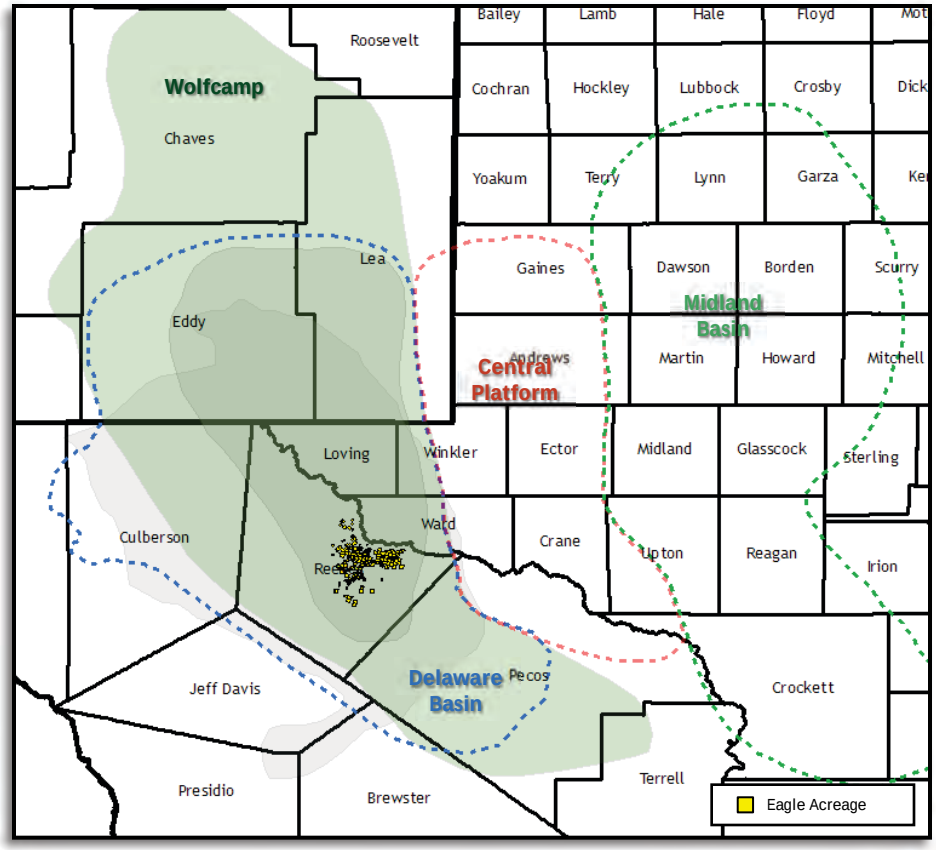
Wolfcamp

Wolfcamp Depositional Area



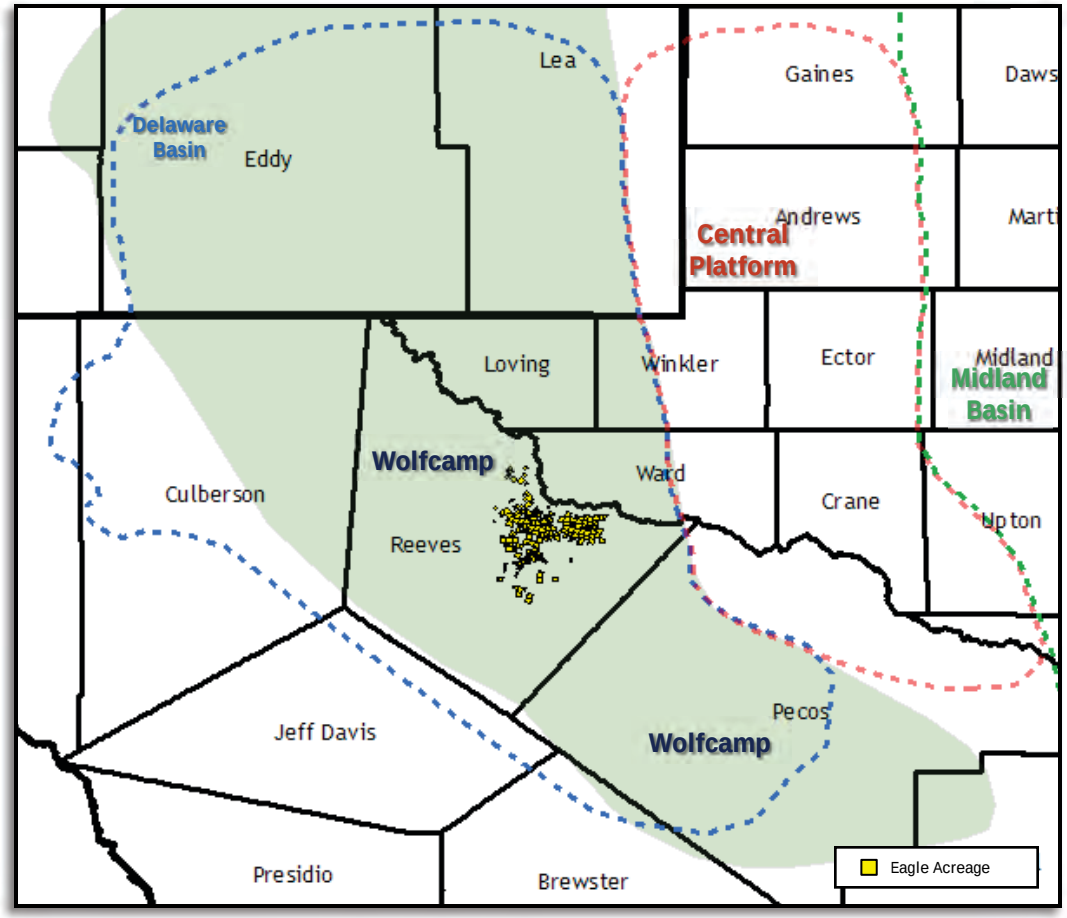
PERIOD	SERIES	DELAWARE BASIN
		FORMATION
QUATERNARY		ALLUVIUM
TERTIARY		
CRETACEOUS	GULFIAN	
	COMAN-CHEAN	FREDERICKSBURG
		TRINITY SD.
	UPPER	SANTA ROSA
PERMIAN	OCHOAN	DEWEY LAKE
		RUSTLER
		SALDO
		CASTILLE
	GUADALU-PIAN	DE SANDS: BELL CANYON
		CHERRY CANYON
		BRUSHY CANYON
	LEONARDIAN	1ST BONE SPRING: UPPER AVALON SH.
		LOWER AVALON SH.
		1ST BONE SPRING SD.
		2ND BONE SPRING
		3RD BONE SPRING
	WOLFCAMPIAN	WOLFCAMP
Pennsylvanian	VIRGIL	CISCO
	MISSOURI	CANYON
	DES MOINES	STRAWN
	ATOKA	ATOKA
	MORROW	MORROW

The Wolfcamp shale is a highly overpressured source rock and reservoir in the Eagle area of the Delaware Basin

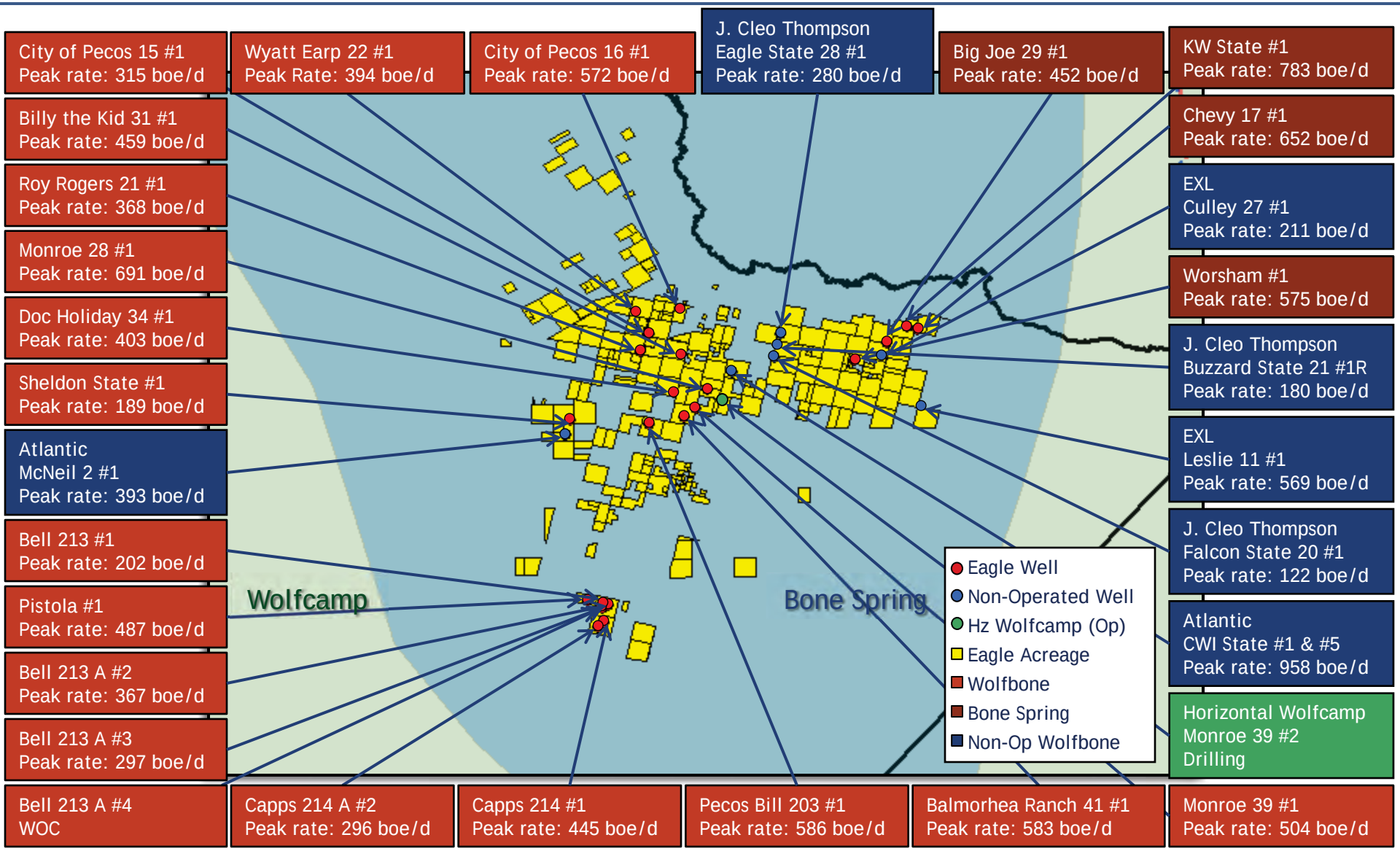
Wolfcamp – The Source of the Delaware's Success

Wolfcamp Geologic Characterization

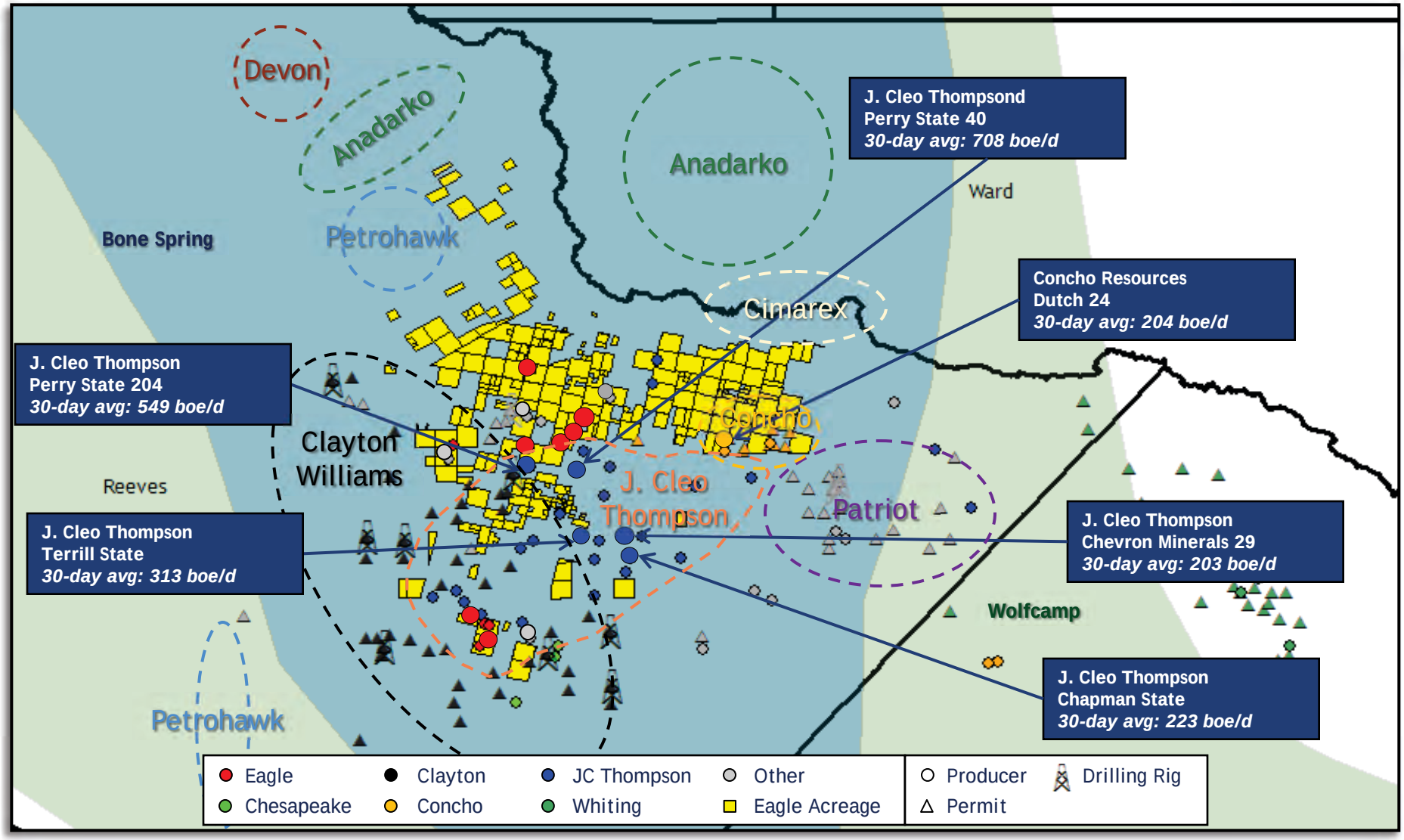
- Ideal mineralogy and grain-size distribution to behave as both a source rock and a reservoir
- 108 MMboe in-place per square mile
- Approximately 1,000' thick
  - 2-5% TOC
  - 50-90% quartz & carbonate, 10% clay
- 0.7 psi/ft pressure gradient
  - From in-situ hydrocarbon generation & storage
  - Higher production rates
  - Shallower declines
- Carbonate debris flows were the primary target
  - Conventional Wolfcamp production
- Industry now targeting the source rock
  - Modern D&C techniques



Eagle Well Locations

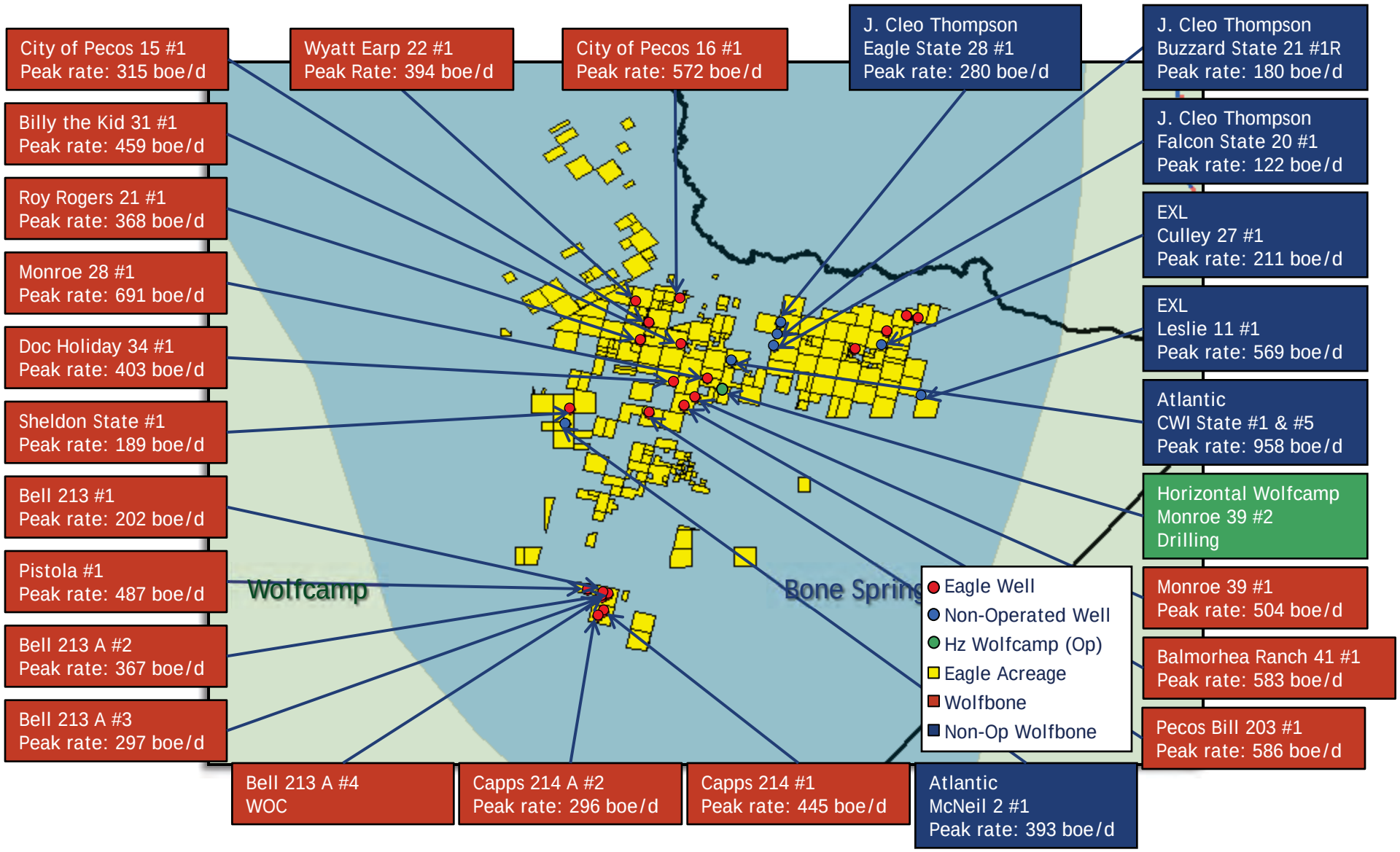


Wolfbone Industry Activity



Source: HPDI and Eagle data. Producing wells.

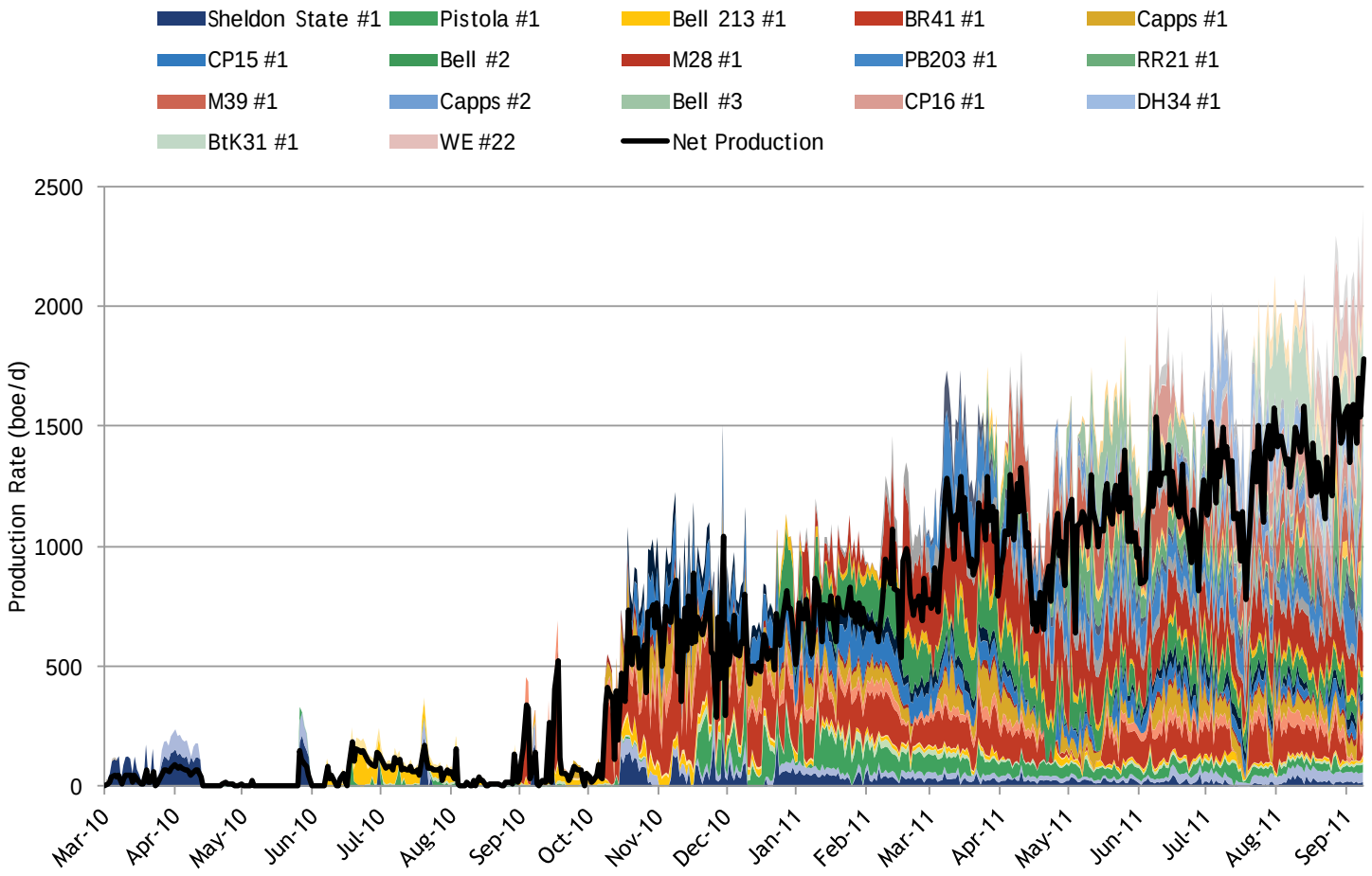
Eagle Wolfbone Activity



Eagle Operated Wolfbone Production

Total Current Net Production: 1,780 boe/d (2,404 boe/d gross) (1)

Includes 17 operated wells



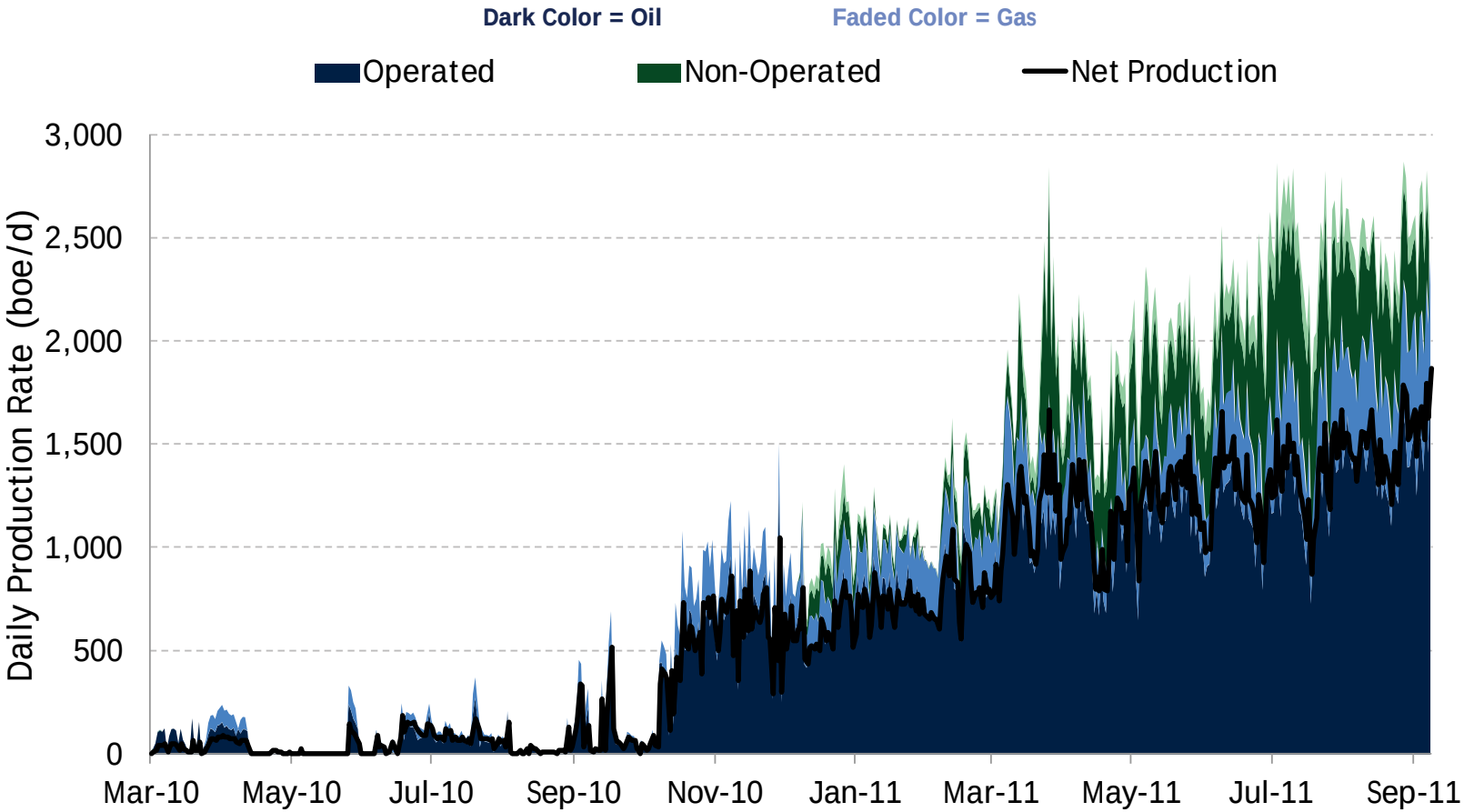
Source: Company Data

(1) Production Data as of 9/30/11.

Eagle Wolfbone Production

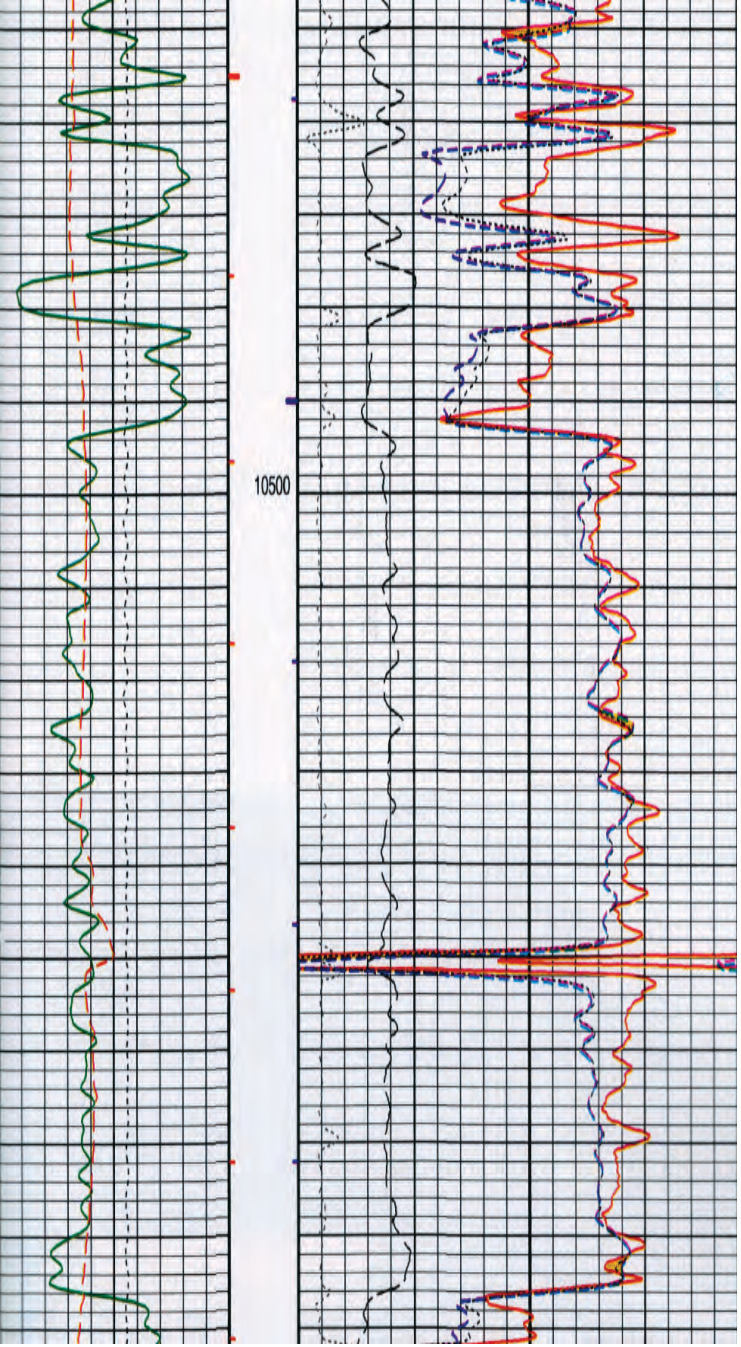
Total Current Net Production: 1,869 boe/d (2,930 boe/d gross) (1)

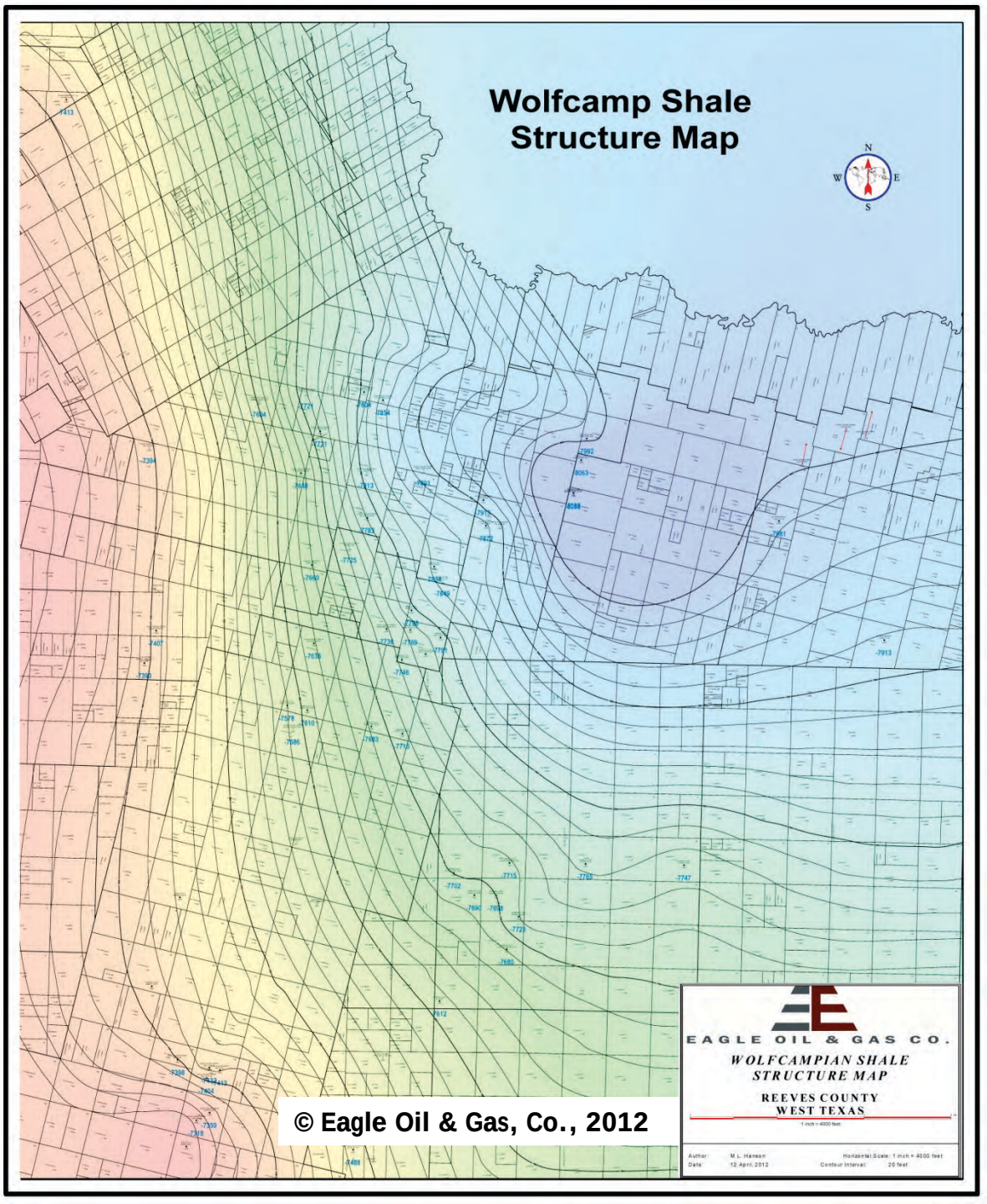
Includes 24 wells (17 operated)



Source: Company Data

(1) Production Data as of 9/30/11 or most recent data available.





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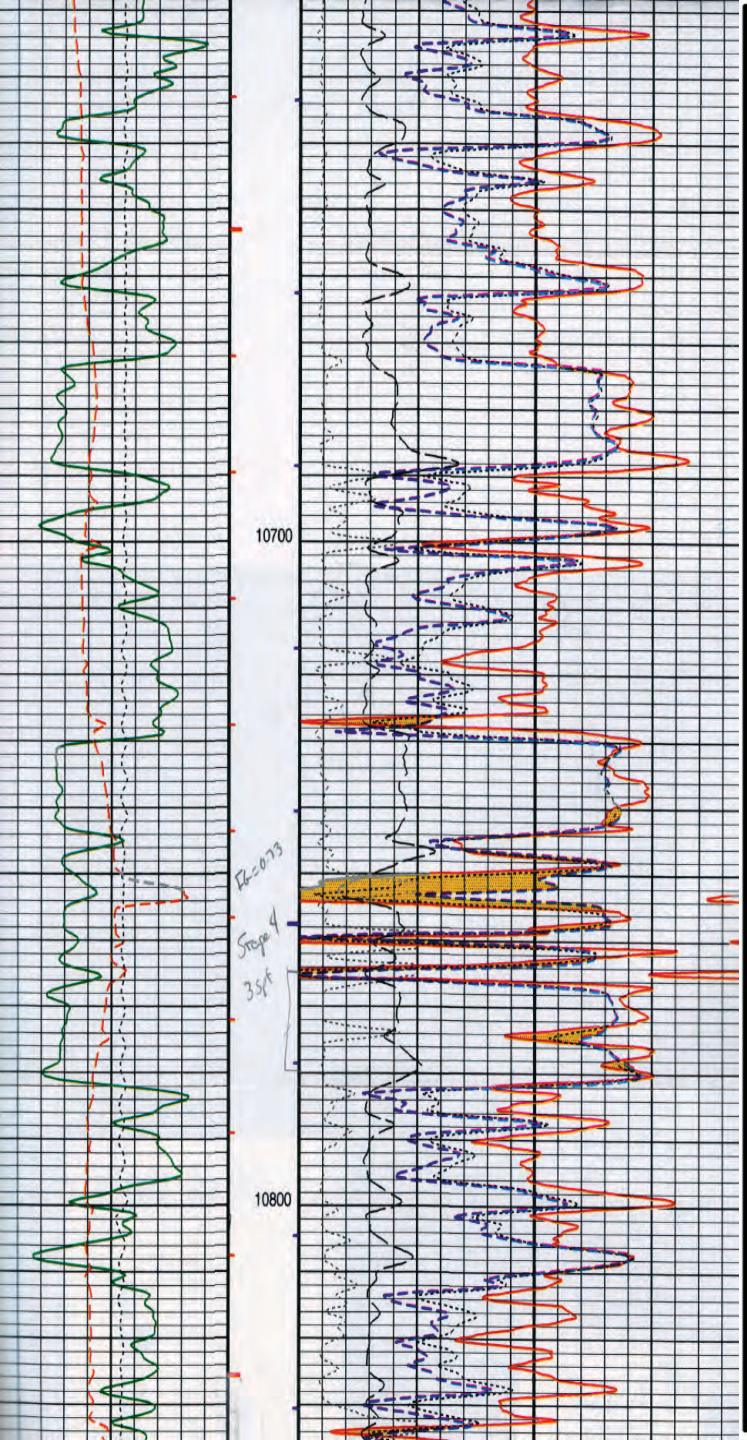

Wolfcampian Shale Isopach Map

Ward County

NO DATA

Reeves County

SLOPE

BASIN FLOOR

Slope to Basin Floor Contact

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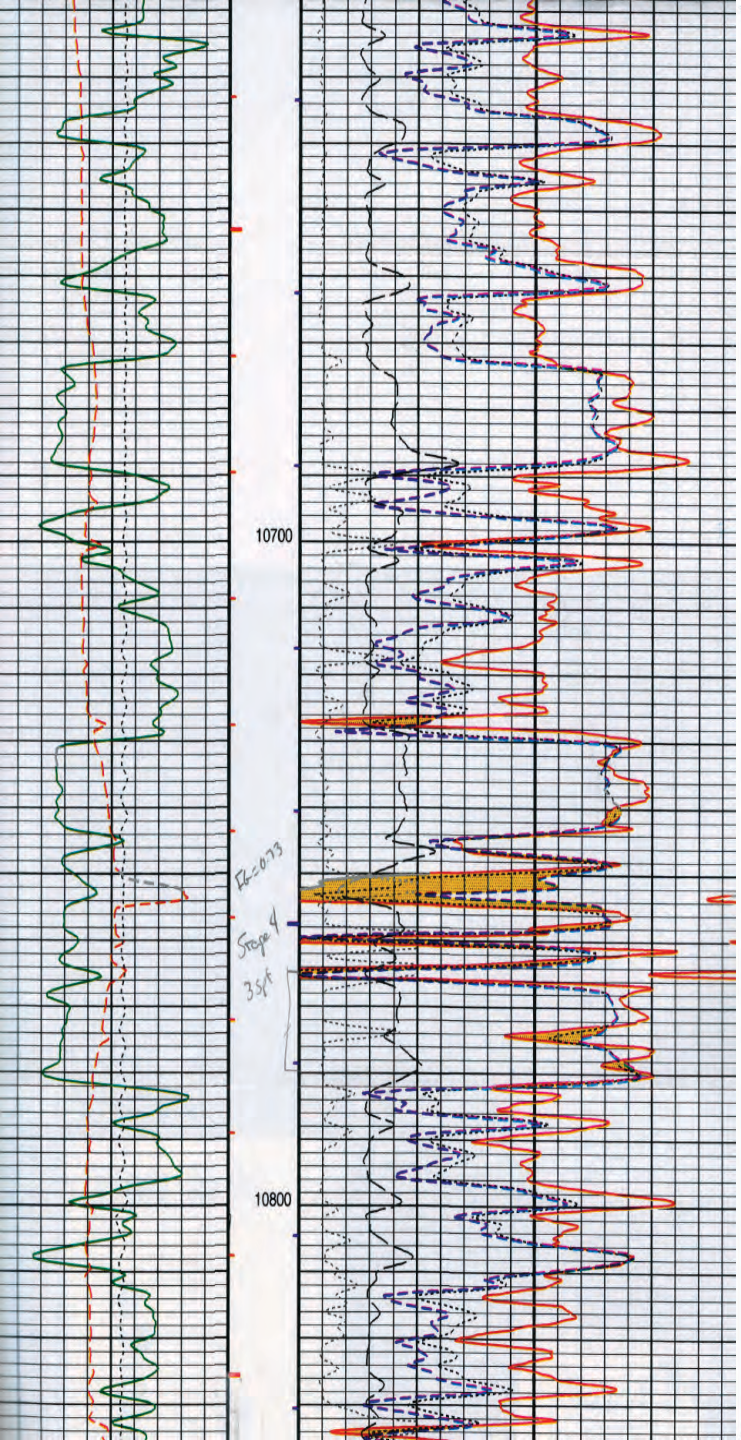
WOLFCAMPIAN SHALE ISOPACH MAP

REEVES COUNTY WEST TEXAS



Sheldon Carbonate Isopach Map

Turbidite Channel Cross-Section

Slope to Basin Floor Contact

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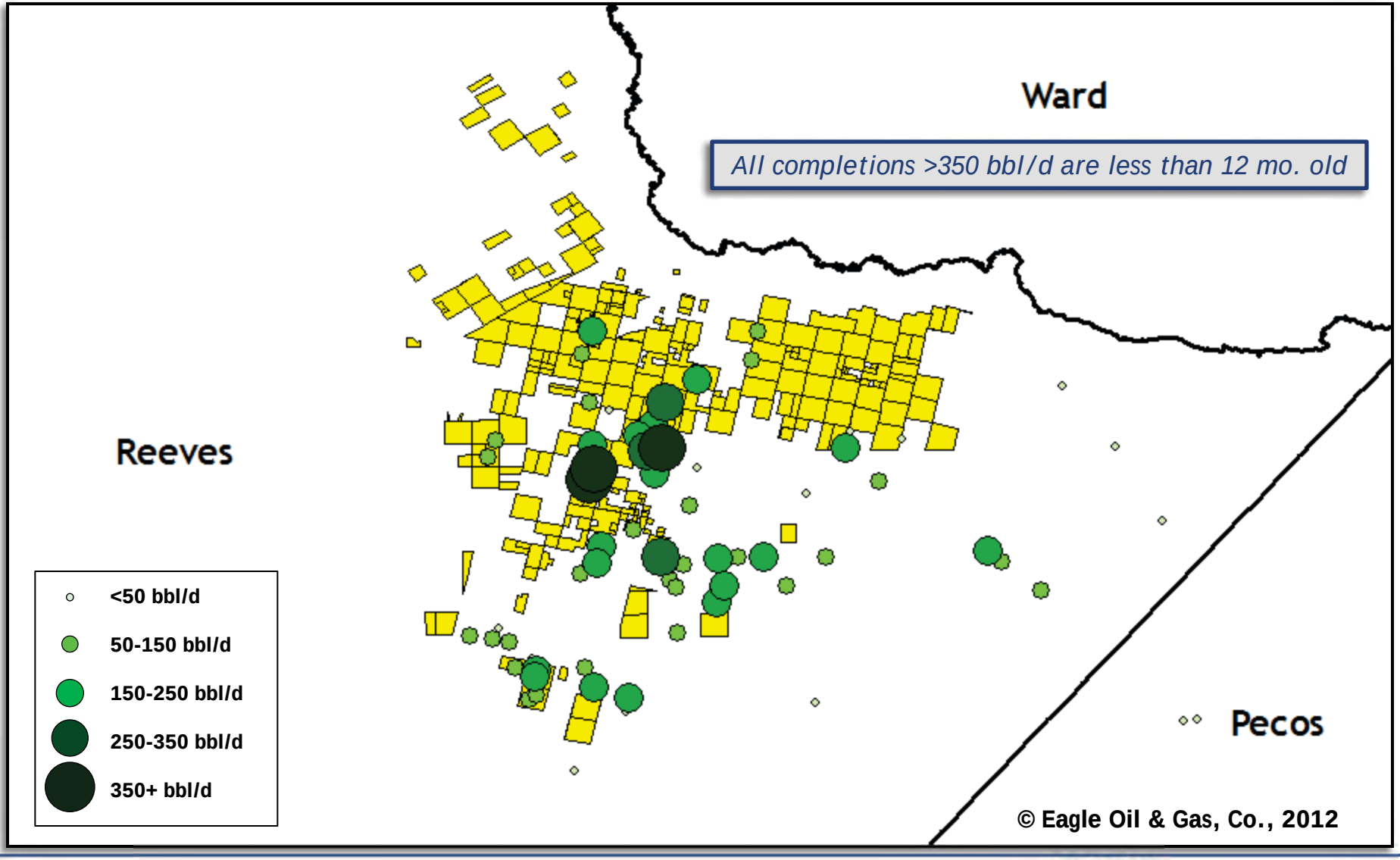
Sheldon Carbonate ISOPACH MAP

REEVES COUNTY
WEST TEXAS

Author M.L. Hanson
Date 12 April 2012
Horizontal Scale 1inch = 4000 feet
Contour Interval 10 feet

Wolfbone 30-Day IP Bubble Map



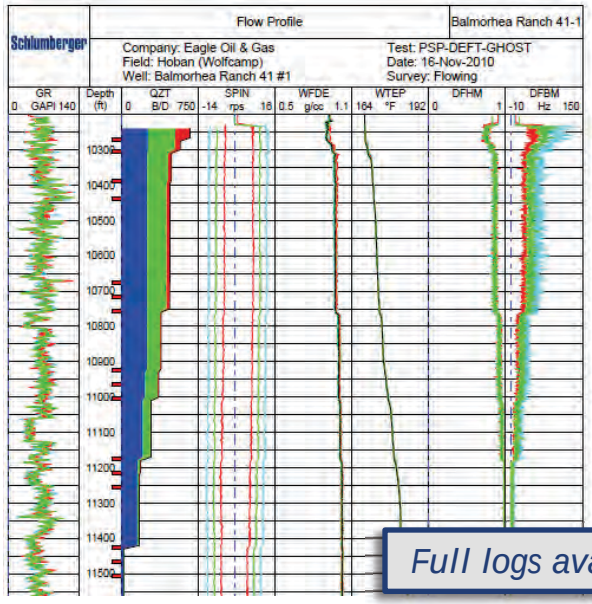
NOTE: Wells completed as Wolfbone producers after 1/1/2009 – Hoban, Hoban South, Wolfbone fields.

Production Logs = Precision Completions

Production Logs Used to Identify Target Intervals

- Eagle has run production logs in 9 Wolfbone wells
- Tool has multiple sensors to identify contributing intervals:
  - Spinner with dual-axis caliper
  - Pressure and temperature sensors
  - Digital Entry Flowview Imaging Tool (DEFT)
    - Water measurement
  - Gas Holdup Optical Sensing Tool (GHOST)
    - Gas measurement

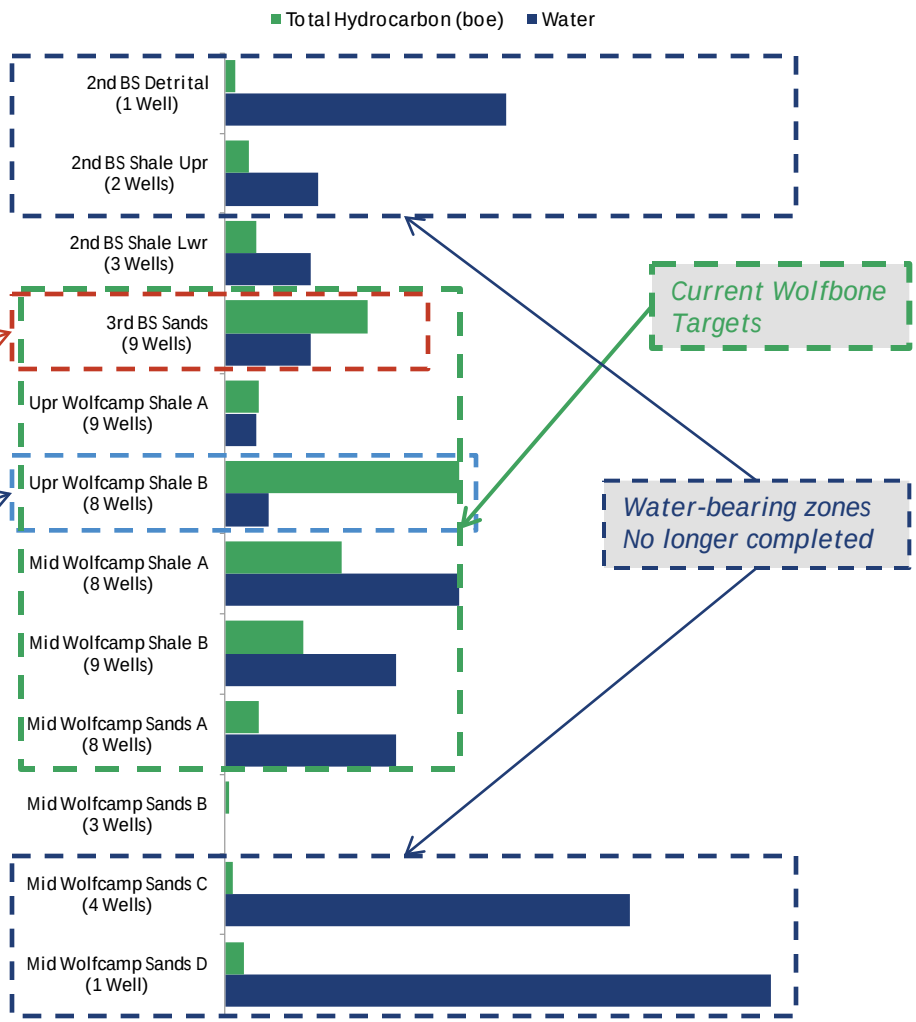
Previously Drilled Hz Target



Full logs available in VDR

Current Hz Target
Monroe 39 #2H

Relative Flow Contribution by Member[(1)]

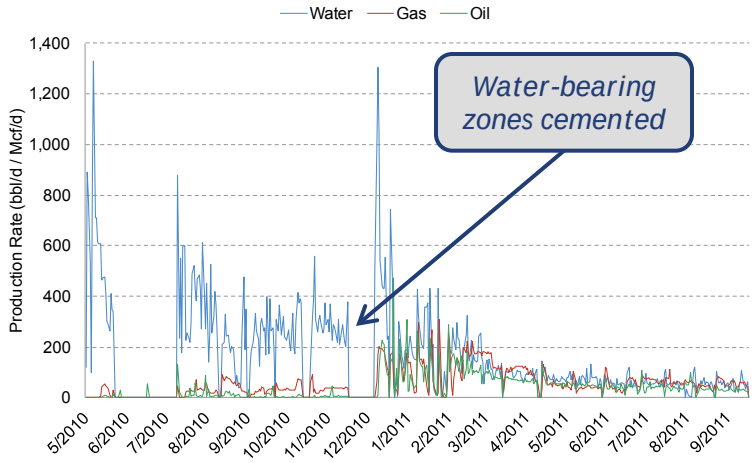


Plugging Water-Bearing Zones Improves Profits

Pistola #1 Case History

- Eagle's 2nd Wolfbone completion
- Well initially flowed >1,000 bblw/d
- Leveled out ~150 bblw/d
- Re-entered wellbore and cement squeezed Middle Wolfcamp Sands C&D
- Re-completed Middle and Upper Wolfcamp shales and 3rd Bone Spring Sands
- ***Well IP'd > 450 bopd following intervention***

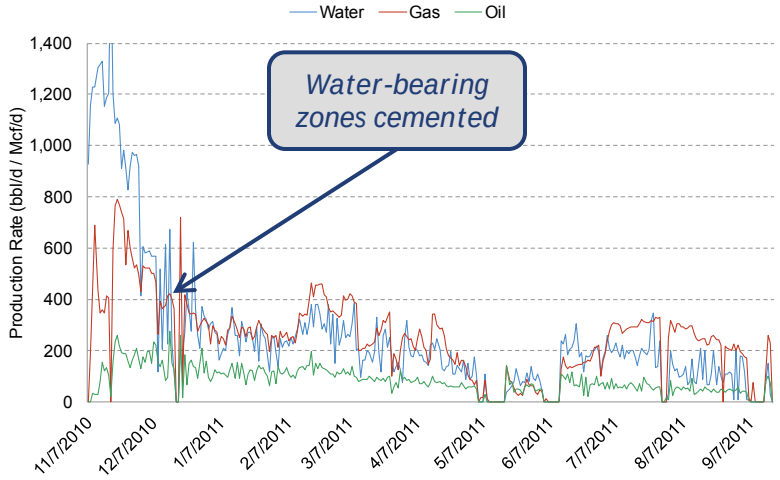
Pistola #1 Production History



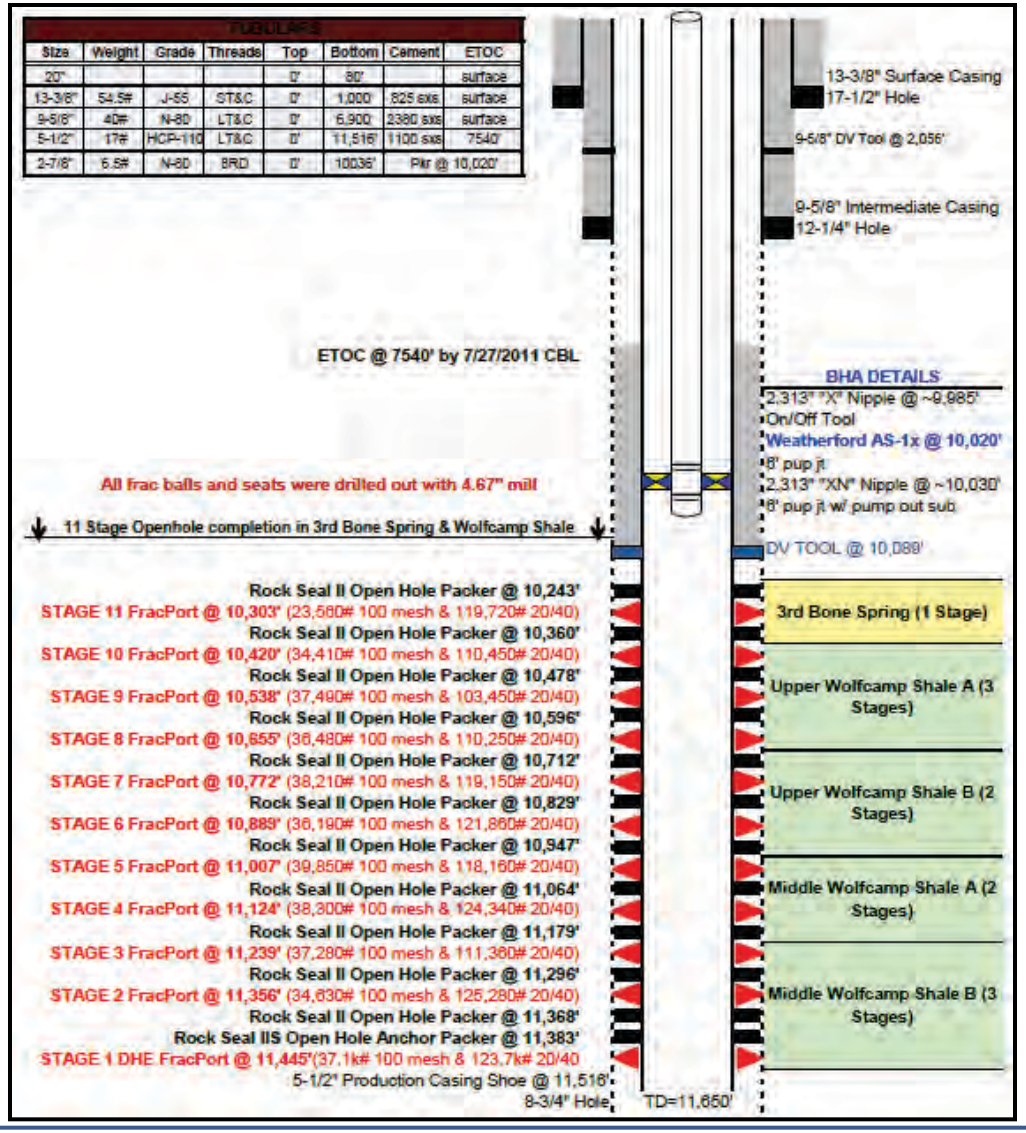
City of Pecos 15 #1 Case History

- Ealge's 6th Wolfbone completion
- Well initially flowed >1,200 bblw/d
- Decreased to ~600 bblw/d over 30 days
- Re-entered wellbore and cement squeezed Middle Wolfcamp Sands C
- Re-completed Middle and Upper Wolfcamp shales and 3rd Bone Spring Sands
- ***WOR cut in half to ~1.5 from 3+ vastly improving economics***

City of Pecos 15 #1 Production History



Wolfbone Typical Vertical Well Plan (Billy the Kid 31 #1)



11,650' TD

11 Stage Frac

- **Completion Type**
  - Open hole w/ sliding sleeves and packers
- **Stimulation (per stage)**
  - 35,000 # 100 mesh sand
  - 95,000 # 20/40 sand
  - 25,000 # 20/40 resin-coated proppant
  - 160,000 gal slickwater / X-link gel
- **Stimulation (total job)**
  - 1.7 MM# proppant
  - 1.8 MM gals fluid

Eagle has used 2 rigs to drill each Wolfbone well:

1. ***Spudder rig 800 HP drills to 5,000' and sets intermediate casing***
2. ***1,200 HP rig drills to TD , sets production casing***

Eagle currently operates 2 larger rigs (1,200 HP and 1,500 HP)

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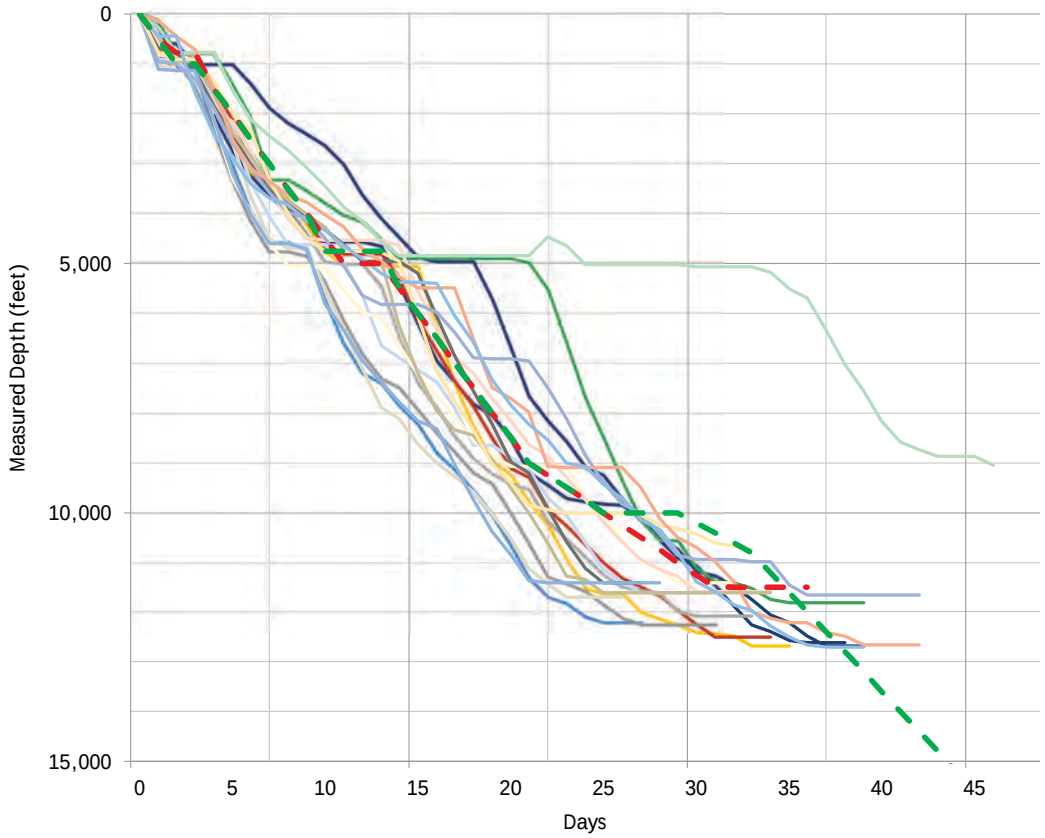
Wolfbone Drilling Curves



Well	Spud	TVD (ft)	Spud-to-TD	Spud-to-RR
Sheldon #1	12/28/2009	12,685	37	39
Pistola #1	2/15/2010	12,602	36	38
Bell #2	4/10/2010	11,800	35	39
Bell #1	4/12/2010	12,674	33	35
Balamorhea Ranch	6/18/2010	12,500	31	34
Capps #1	8/4/2010	12,084	30	33
City of Pecos 15 #1	9/17/2010	12,206	25	27
Monroe 28 #1	10/21/2010	12,250	27	31
Pecos Bill 203 #1	12/30/2010	11,690	23	26
Monroe 39 #1	1/30/2011	11,601	27	31
Capps #2	3/7/2011	11,405	29	32

Well	Spud	TVD (ft)	Spud-to-TD	Spud-to-RR
Wyatt Earp #1	3/7/2011	11,582	30	34
Culley 27 #1	3/18/2011	12,655	39	42
Bell #3	3/19/2011	11,407	25	27
Doc Holliday 34 #1	4/3/2011	11,600	25	34
Leslie 11 #1	4/30/2011	12,700	37	39
City of Pecos 16 #1	5/4/2011	11,419	22	28
Billy the Kid 31 #1	6/10/2011	11,650	36	42
Bell #4	7/17/2011	9,055	46	46
Monroe 39 #2H	7/30/2011	10,753	33	33
Planned Vt		11,500	31	36
Planned Hz		15,500	45	48

Focusing the Effort

Most recent wells completed consistently with excellent results

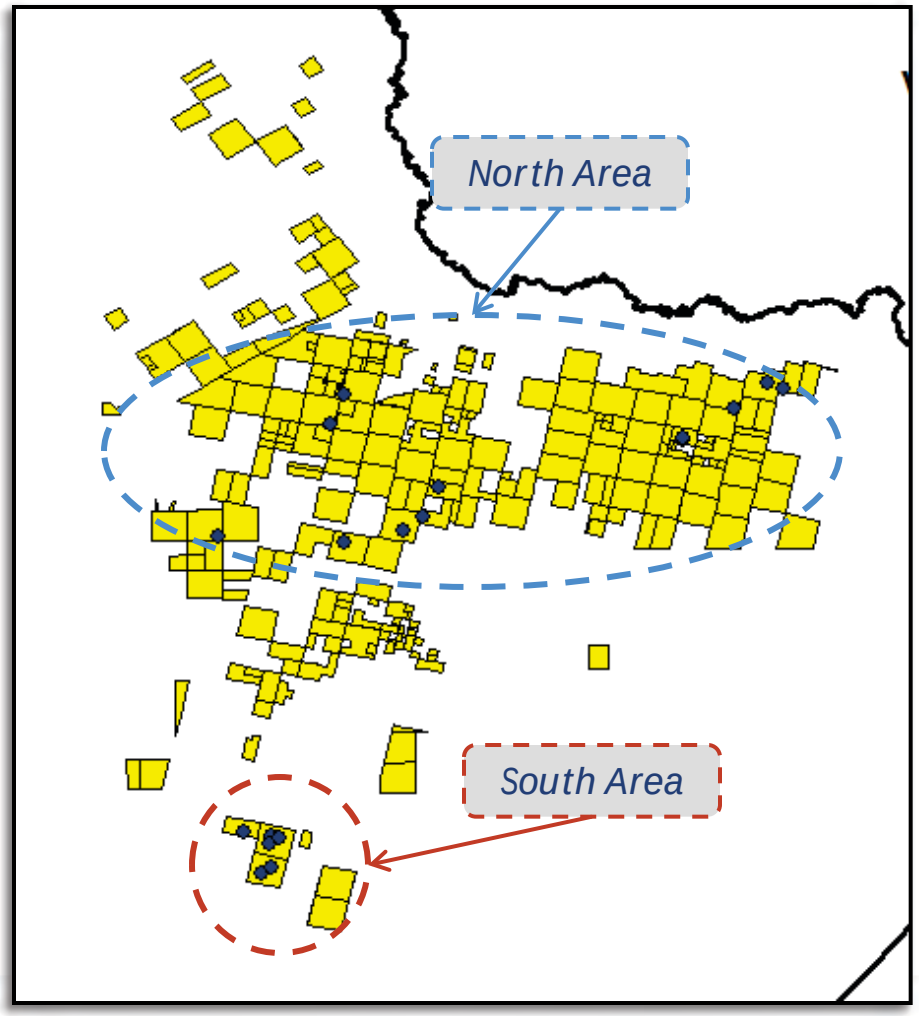
Geographically Different – Same Improvement

Northern Area

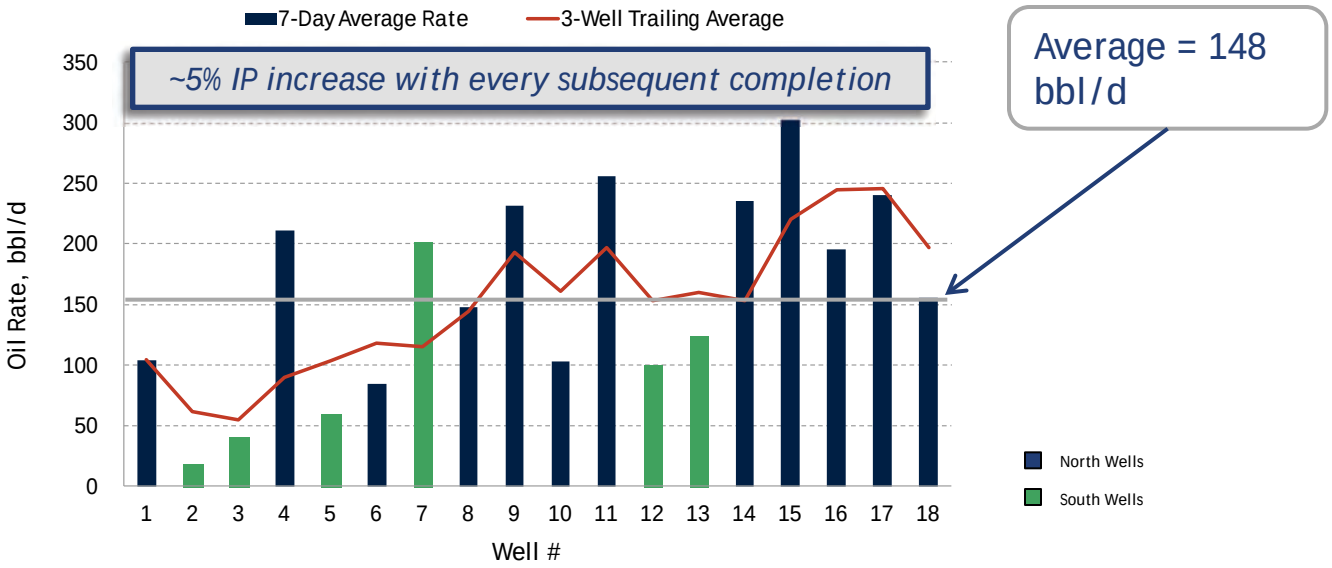
		Sheldon #1	BR41 #1	CP15 #1	M28 #1	PB203 #1	RR21 #1	M39 #1	CP16 #1	DH34 #1	BIK31 #1	Wyatt 22 #1
Peak Rate (boe/d)		315	583	394	691	586	368	504	572	403	459	394
Approx. Depth												
1st BS Shale - Avalon												
2nd BS Detrital	9,250	1										
2nd BS Shale Upr	9,600			1								
2nd BS Shale Lwr	9,850	1		1								
3rd BS Sands	10,150	1	1	1	1	1	1	1	1	1	1	1
Upr Wolfcamp Shale A	10,440	1	1	1	1	1	2	2	3	2	3	3
Upr Wolfcamp Shale B	10,700		1	1	2	2	2	2	2	2	2	2
Mid Wolfcamp Shale A	10,900		1	1	1	1	2	2	3	2	2	2
Mid Wolfcamp Shale B	11,100	1	1	1	1	1	2	2	2	3	3	3
Mid Wolfcamp Sands A	11,400	1	1	1	1	1						
Mid Wolfcamp Sands B	11,650		1		1							
Mid Wolfcamp Sands C	12,000	1	1	1								
Mid Wolfcamp Sands D	12,250	1										

Southern Area

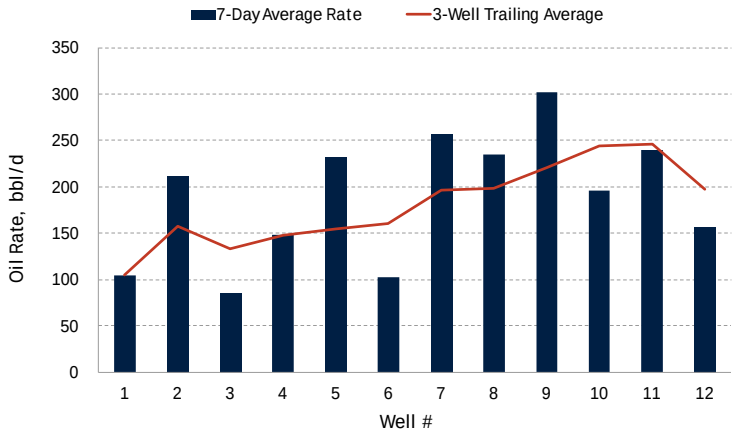
		Pistola #1	Bell #1	Pistola #1	Capps #1	Bell #2	Capps #2	Bell #3
Peak Rate (boe/d)		132	202	487	445	367	296	392
Approx. Depth								
1st BS Shale - Avalon								
2nd BS Detrital	9,250							
2nd BS Shale Upr	9,600							
2nd BS Shale Lwr	9,850							
3rd BS Sands	10,150		1	1	1	1	1	1
Upr Wolfcamp Shale A	10,440		1	1	1	1	1	2
Upr Wolfcamp Shale B	10,700			1	1	1	2	1
Mid Wolfcamp Shale A	10,900		1	1	1	1	2	2
Mid Wolfcamp Shale B	11,100			1	1	1	2	2
Mid Wolfcamp Sands A	11,400	2	1		1	1		
Mid Wolfcamp Sands B	11,650				1	1		
Mid Wolfcamp Sands C	12,000	1	1		1			
Mid Wolfcamp Sands D	12,250	1	1					



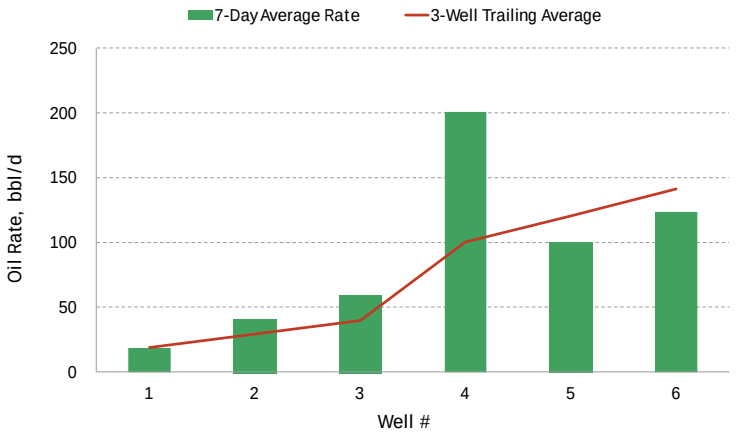
IP's Trending Upward as Completions Improve



North Wells



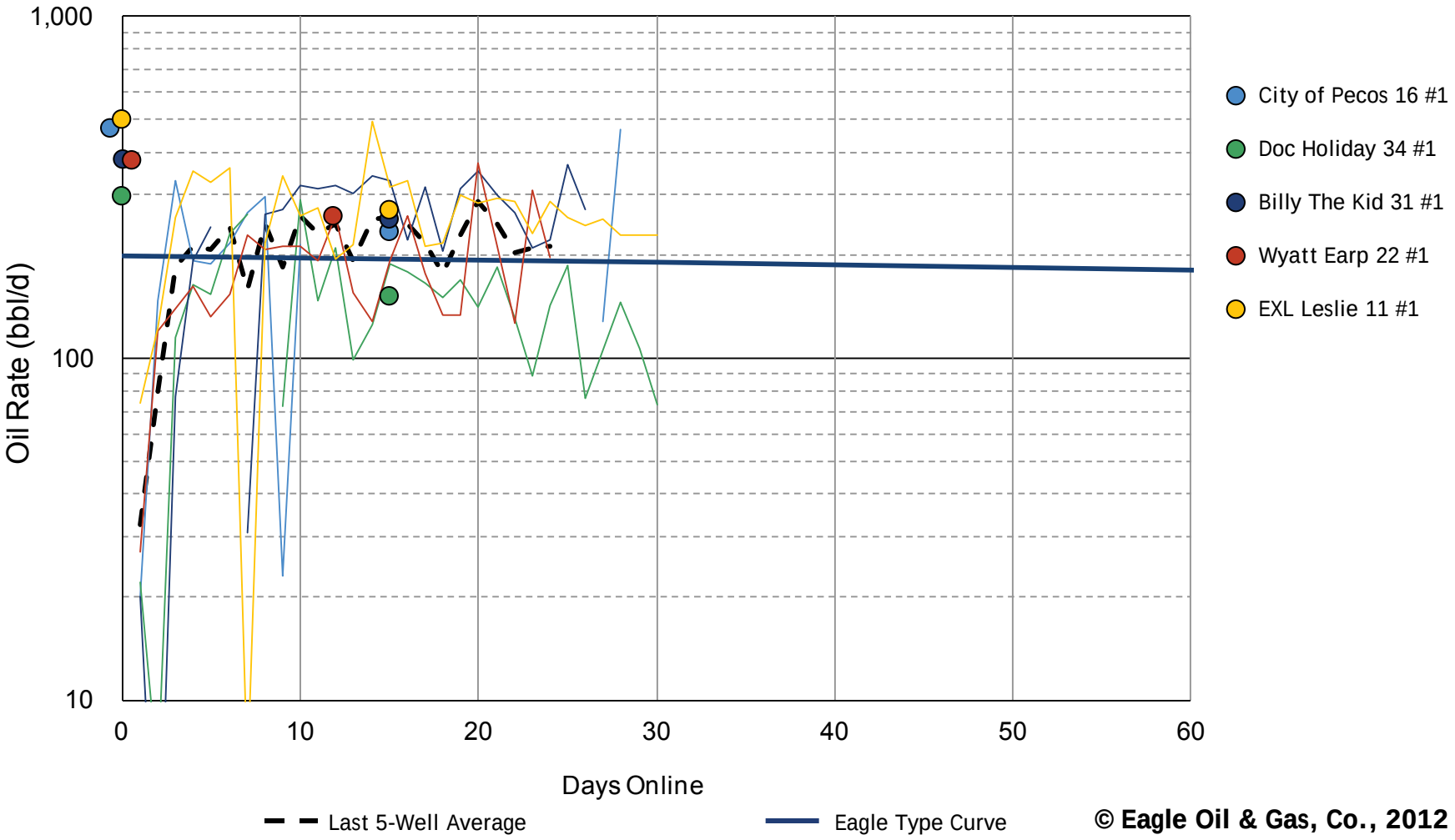
South Wells



NOTE: Eagle operated Wolfbone completions.

Honoring Recent Data

Recent well data; supports type curve IP



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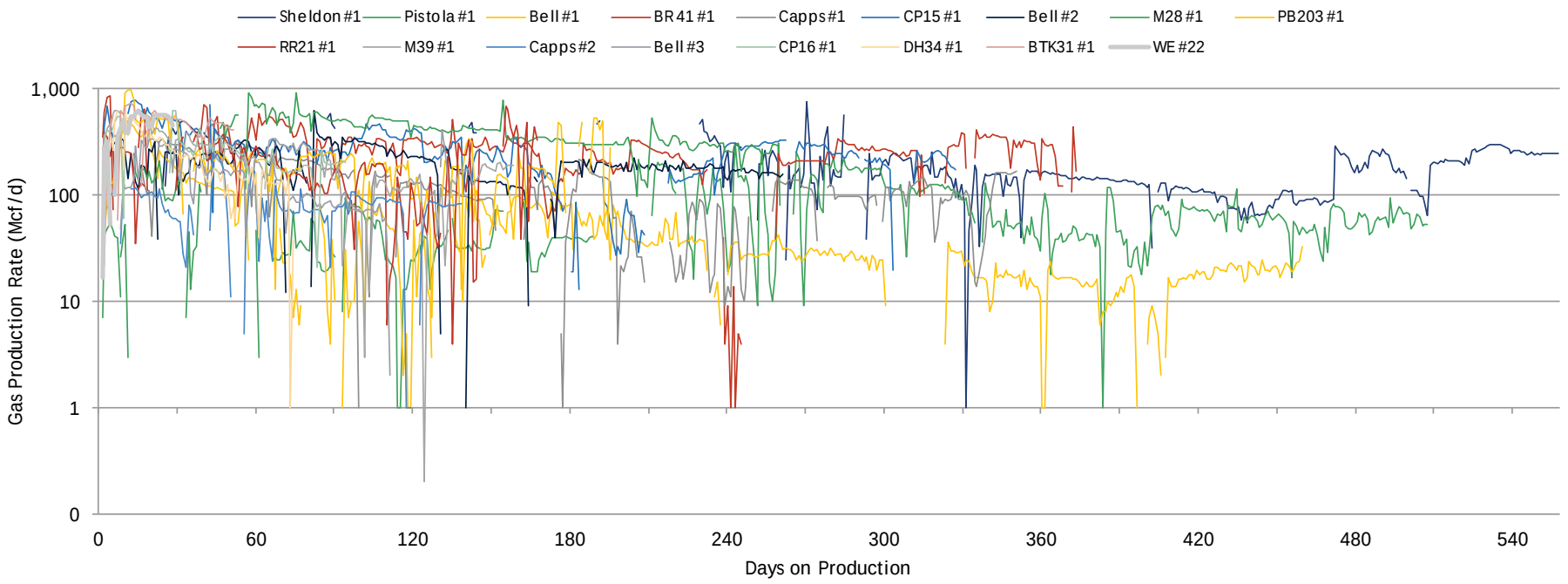
Wolfbone Oil Production History (Eagle Operated)

	Average Oil Rates (bbl/d)[1]																
	SH #1	PIST #1	Bell #1	BR 41 #1	Capps #1	CP15 #1	Bell #2	M28 #1	PB203 #1	RR21 #1	M39 #1	Capps #2	Bell #3	CP16 #1	DH34 #1	BTK31 #1	WE #22
Peak	189	472	133	474	403	262	364	540	421	295	465	290	343	468	292	396	301
7-day	115	19	87	293	68	85	226	148	231	115	256	101	124	244	196	285	147
30-day	124	22	74	246	134	160	187	163	226	144	241	72	193	216	158	292	NA
60-day	120	18	60	244	137	148	174	235	178	126	196	73	156	168	117	NA	NA
90-day	104	29	54	227	119	137	174	244	158	111	180	67	126	NA	NA	NA	NA
180-day	70	72	41	182	99	114	144	214	NA	NA	NA	NA	NA	NA	NA	NA	NA
365-day	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(1) Corrected for shut-ins.

Wolfbone Gas Production History (Eagle Operated)

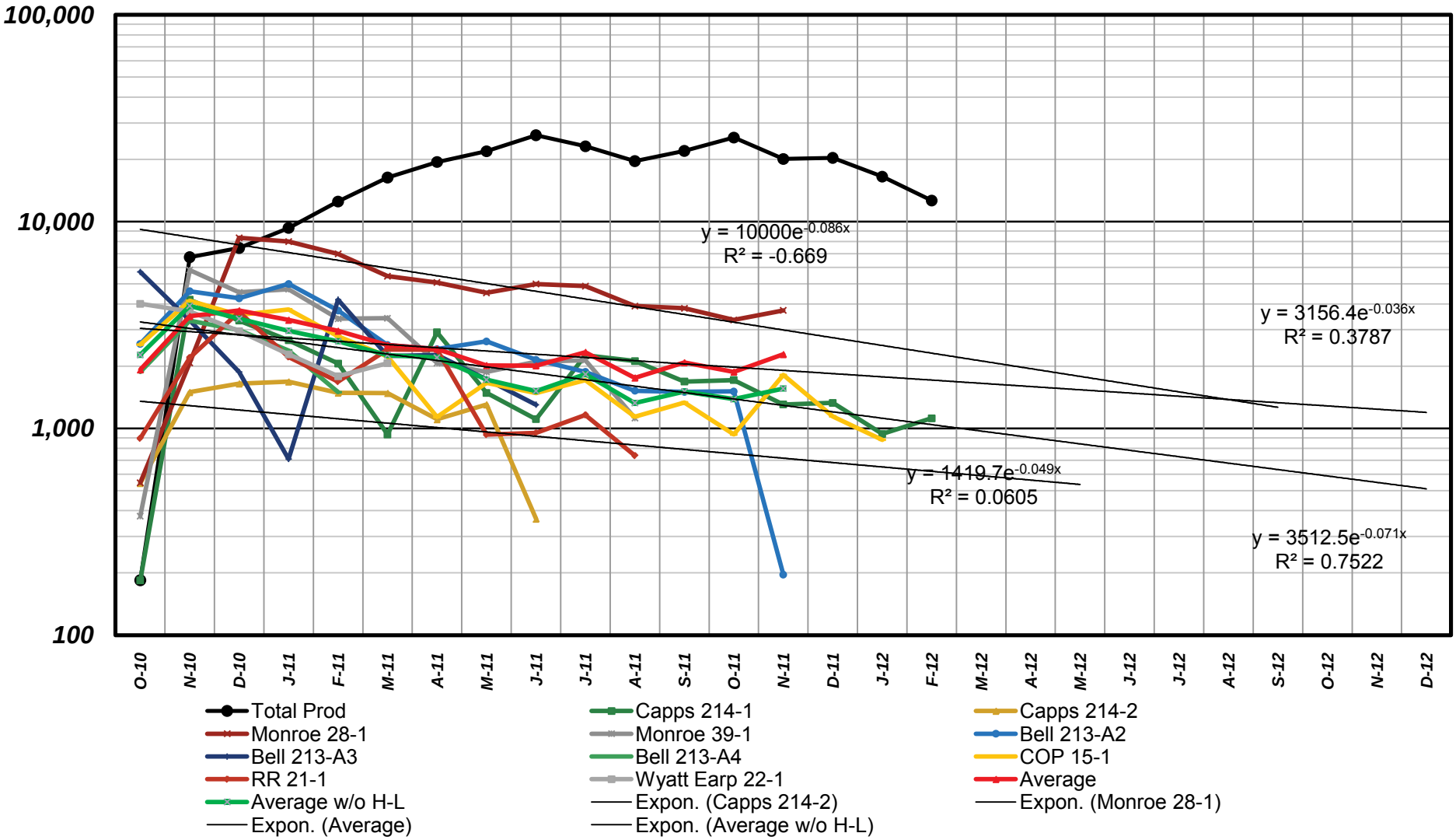


	Average Gas Rates (Mcf/d)[1]																
	SH #1	PIST #1	Bell #1	BR 41 #1	Capps #1	CP15 #1	Bell #2	M28 #1	PB203 #1	RR21 #1	M39 #1	Capps #2	Bell #3	CP16 #1	DH34 #1	BTK31 #1	WE #22
Peak	758	89	413	651	249	790	14	907	987	697	230	35	291	621	667	535	563
7-day	0	30	365	570	142	434	300	149	450	289	517	103	111	453	433	617	421
30-day	237	31	245	441	266	534	211	181	461	275	382	84	227	353	359	512	NA
60-day	278	43	161	399	242	435	230	393	334	242	316	96	192	262	255	NA	NA
90-day	262	54	129	364	208	380	247	427	291	210	280	90	158	NA	NA	NA	NA
180-day	202	95	91	305	151	318	220	395	NA	NA	NA	NA	NA	NA	NA	NA	NA
365-day	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(1) Corrected for shut-ins.

* Courtesy of Riverford Exploration, LLC

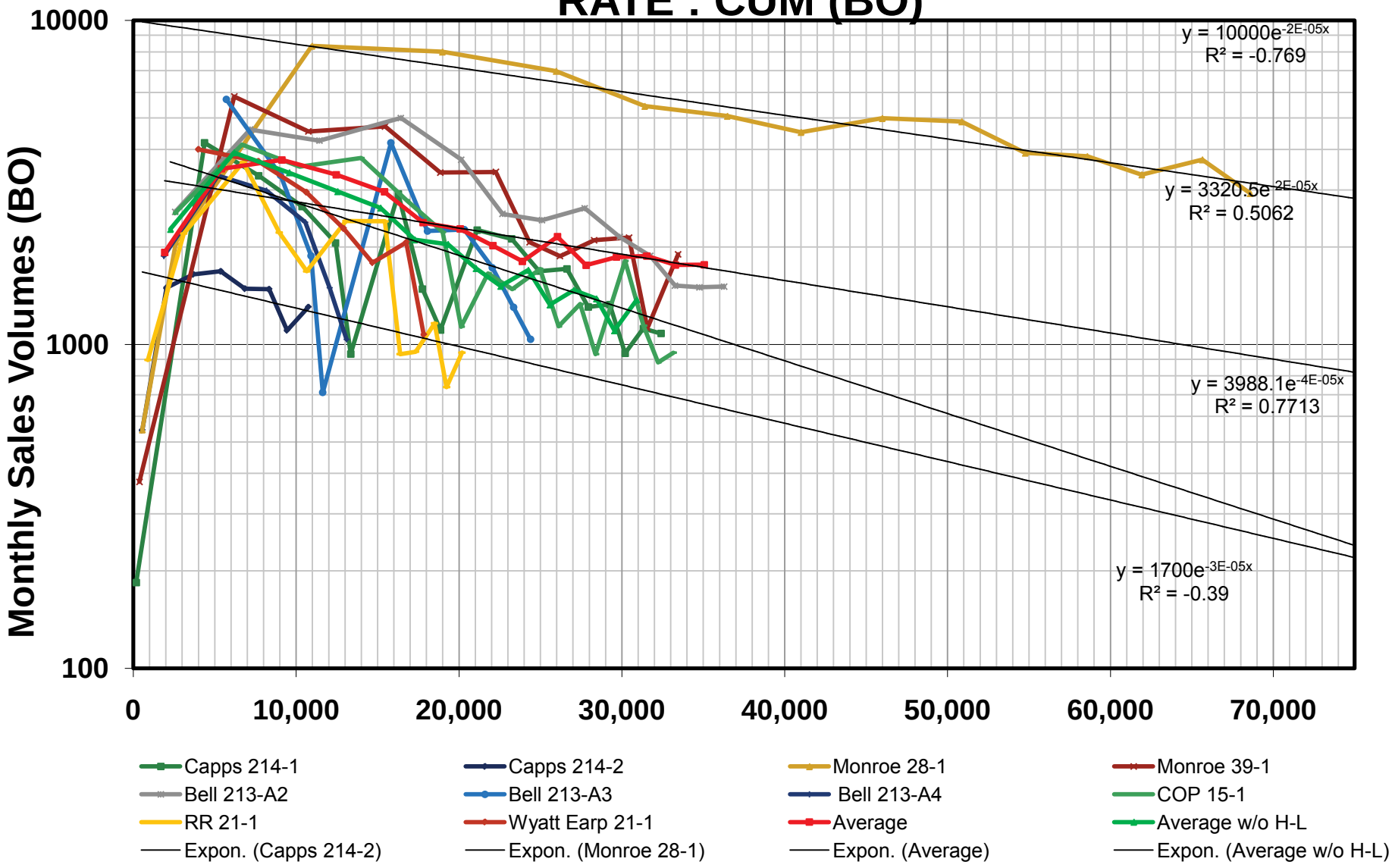
RIVERFORD EXPLORATION, LLC WOLFBONE WELLS RATE:TIME



* Courtesy of Riverford Exploration, LLC

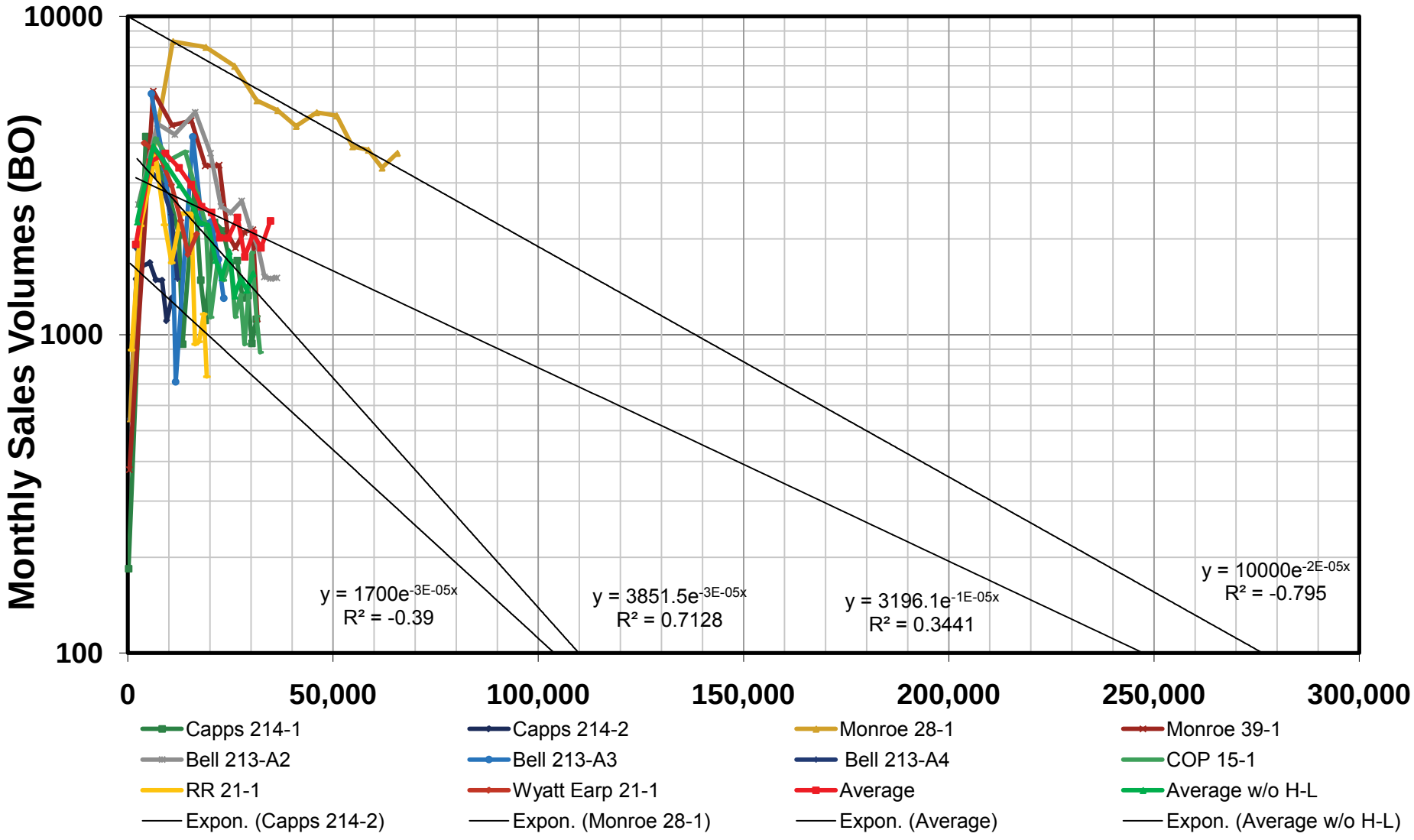
RIVERFORD EXPLORATION, LLC WOLFBONE WELLS

RATE : CUM (BO)



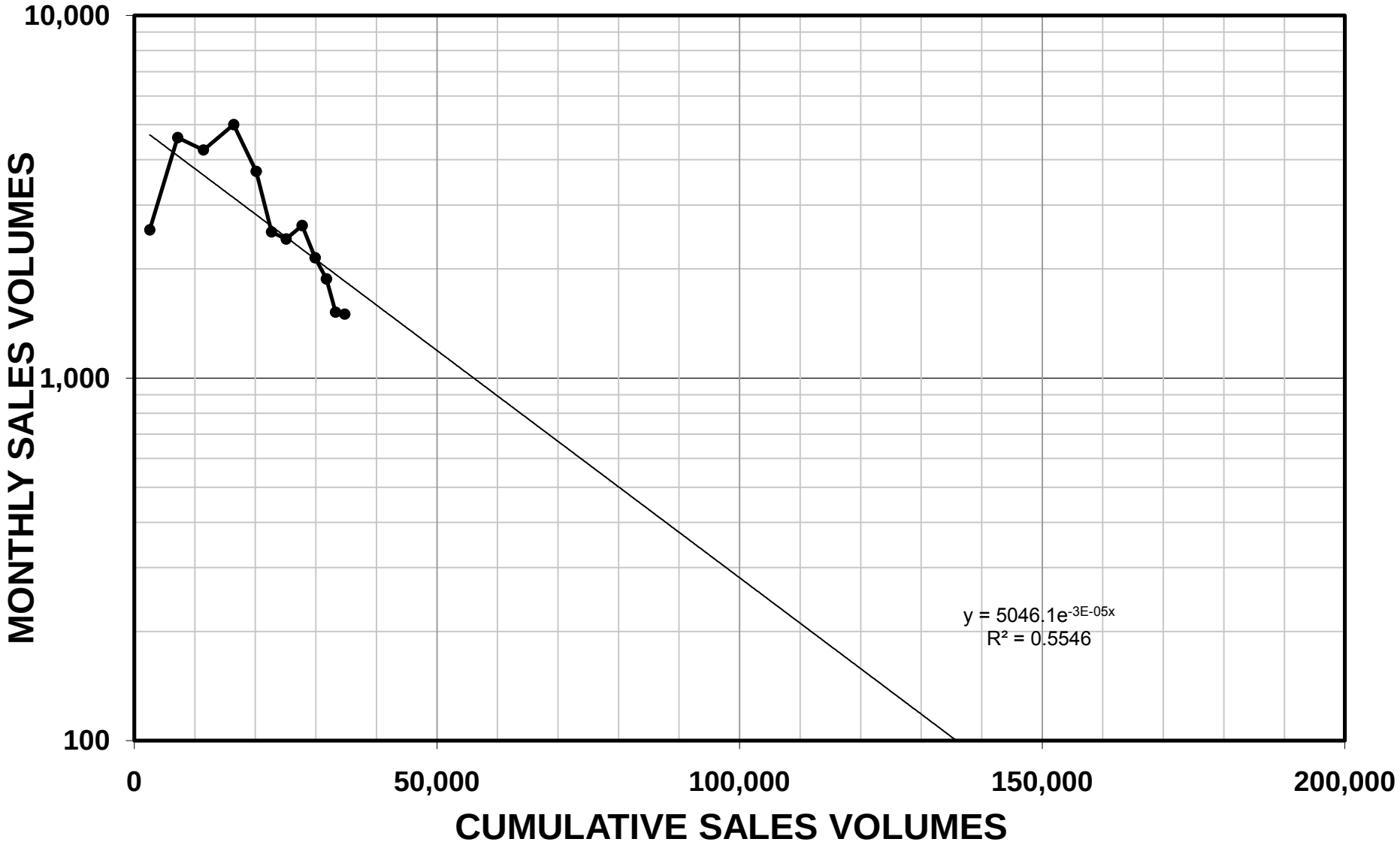
* Courtesy of Riverford Exploration, LLC

RIVERFORD EXPLORATION, LLC WOLFBONE WELLS, RATE : CUM (BO)

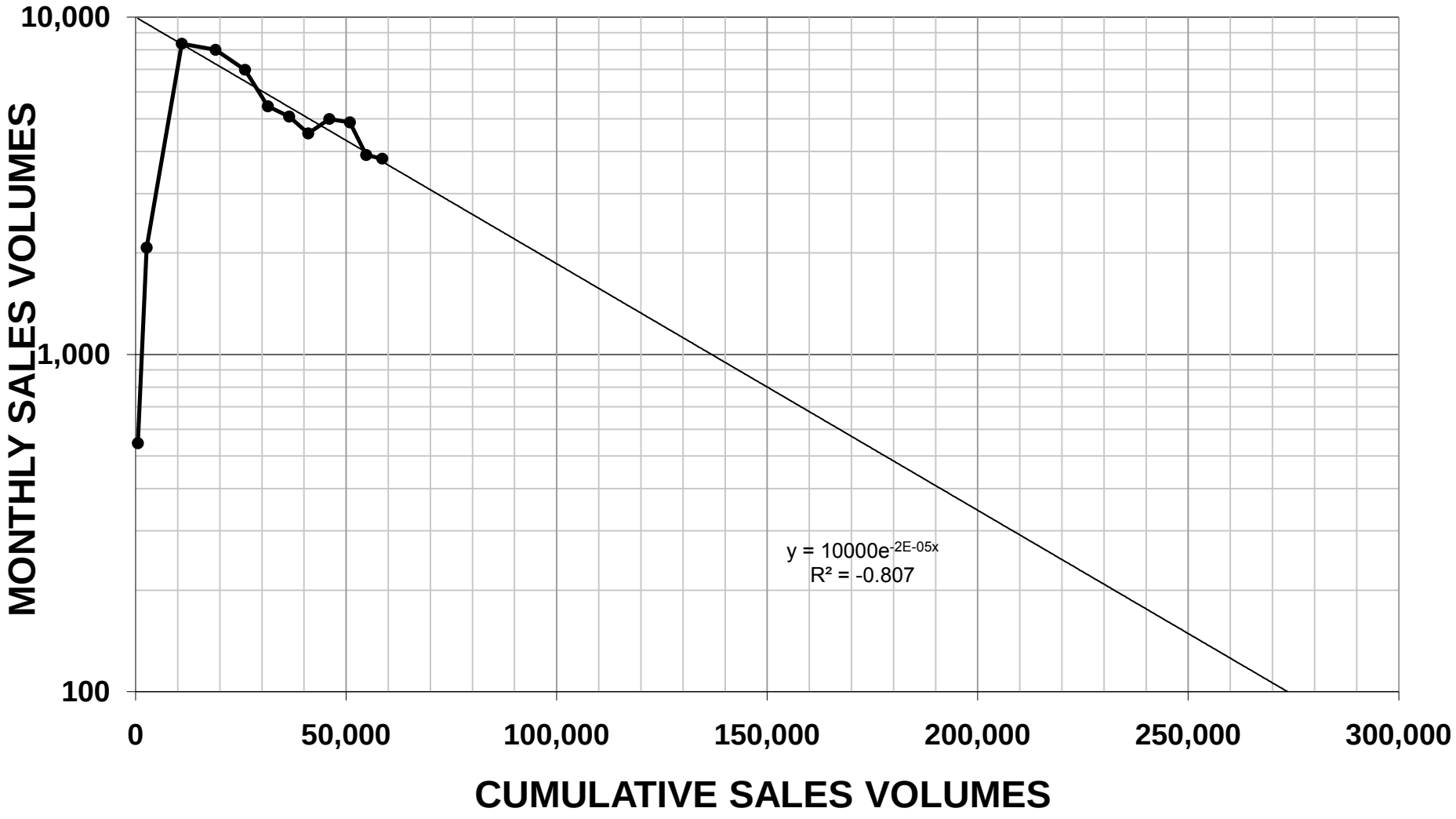


* Courtesy of Riverford Exploration, LLC

BELL 213-A2 (“TYPE WELL”), RATE : CUM (BO)

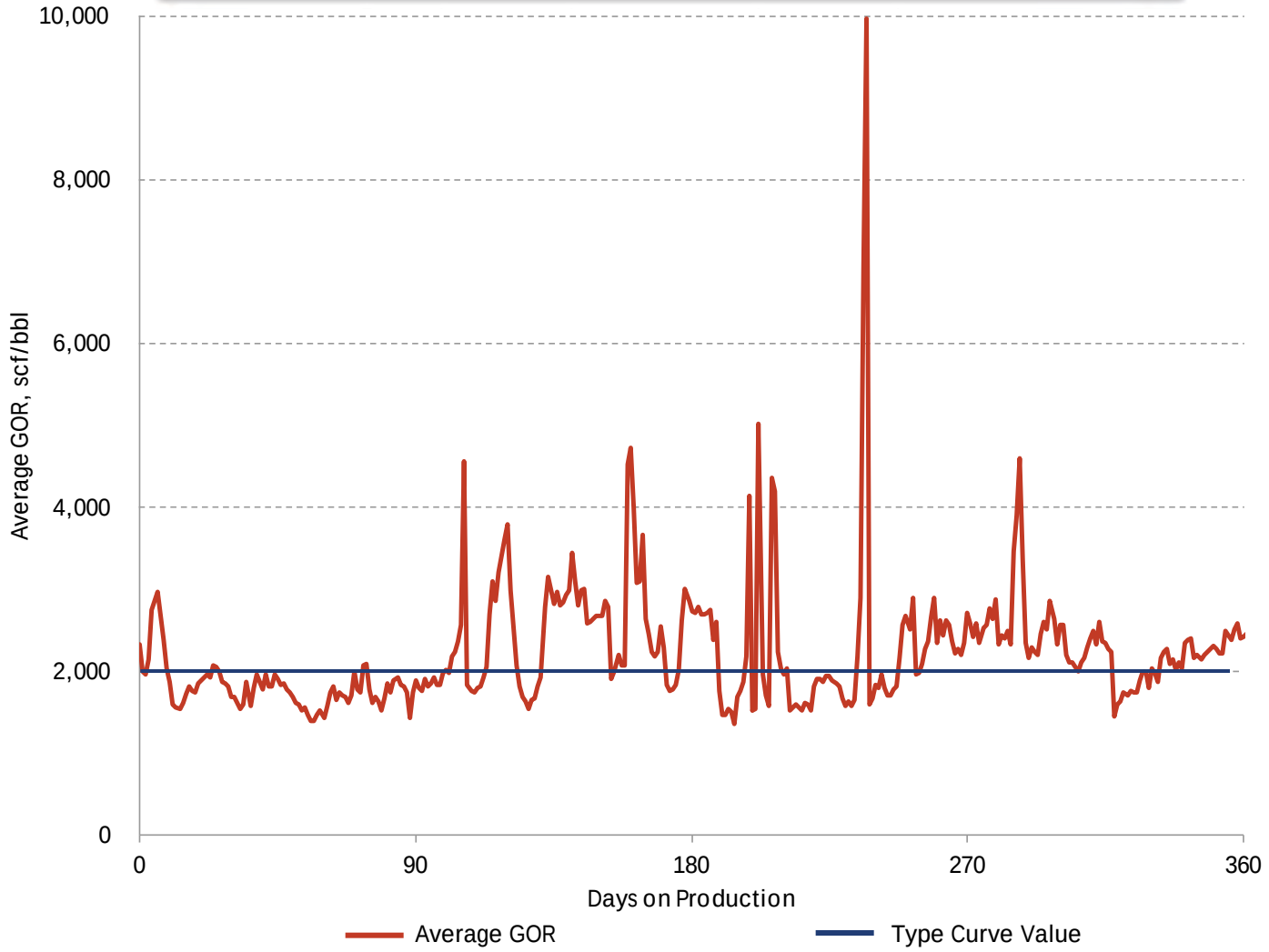


MONROE 28 #1 ("HIGH-SIDE WELL)
RATE : CUM (BO)



Average Wolfbone GOR

2,000 GOR used to generate gas volumes for Wolfbone type curve



NOTE: Data based on Eagle operated Wolfbone completions.

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Wolfbone Fluid Analysis (Balmorhea Ranch #1)

Summary

Oil (1)

Lab:	Mitchell Analytical Labs
Date Sampled:	11/15/2010
API:	49.0
Gravity:	0.7839

Gas

Source:	Mitchell Analytical Labs
Date Sampled:	1/11/2011
Gravity:	0.8293
Wellhead HV (BTU/Mcf):	1,413

Gas Compositional Analysis

Component		Mole (%)	GPM
N2	Nitrogen	0.959	
CO2	Carbon Dioxide	0.221	
C1	Methane	70.178	
C2	Ethane	13.245	3.533
C3	Propane	8.745	2.403
NC4	n-Butane	3.124	0.982
IC4	Isobutane	1.049	0.343
NC5	n-Pentane	0.802	0.290
IC5	Isopentane	0.688	0.251
C6+	Hexanes Plus	0.989	0.438
Total		**100.000**	**8.240**

NGL Recovery

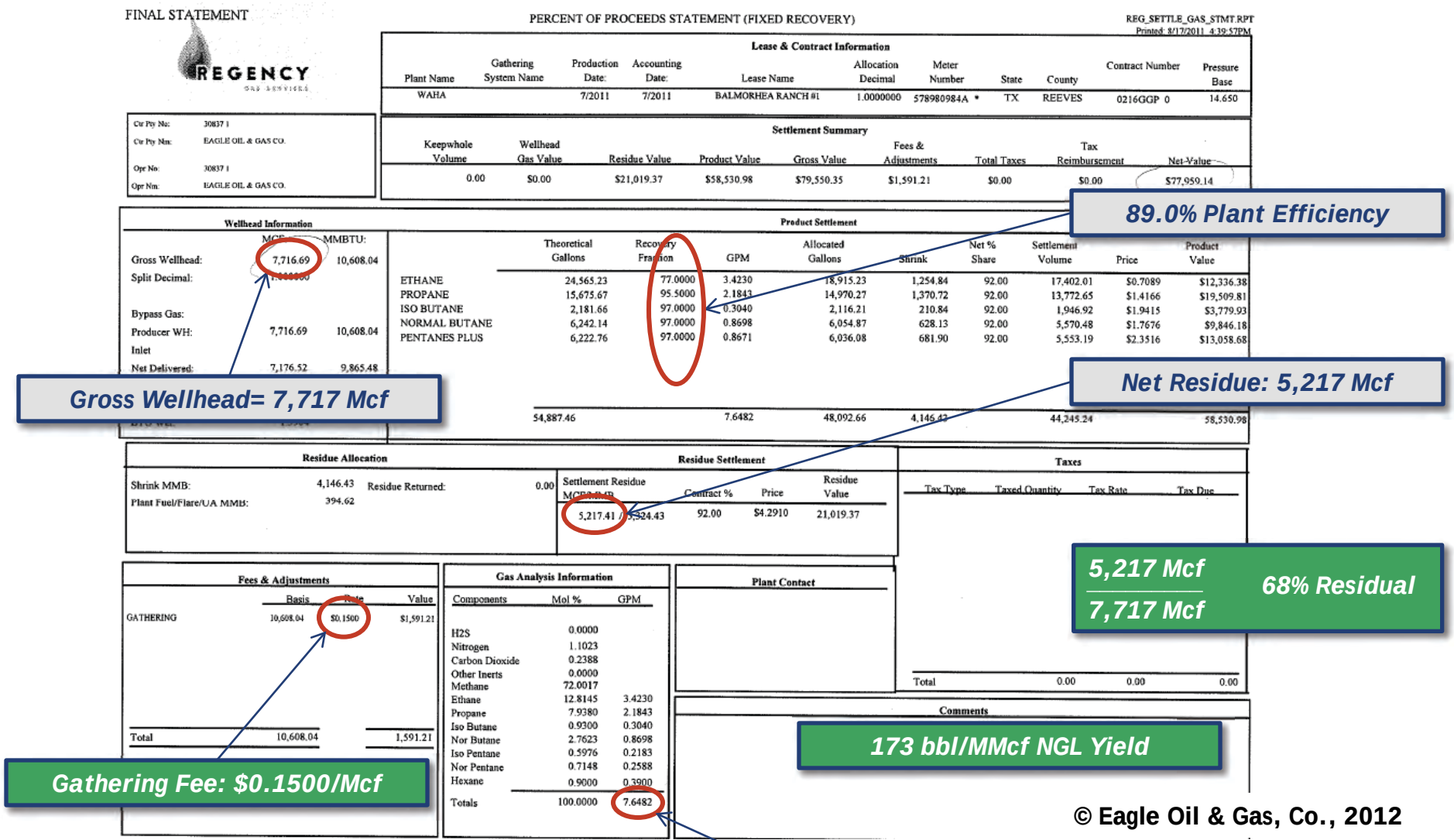
173 bbl/MMcf Recovered
Range: 163 - 236 bbl/MMcf

		Theoretical	Plant Recovery (%)	Actual (GPM)
C2	Ethane	3.5330	77.0%	2.7204
C3	Propane	2.4030	95.5%	2.2949
NC4	Normal Butane	0.9820	97.0%	0.9525
IC4	Iso Butane	0.3430	97.0%	0.3327
NC5	Normal Pentane	0.2900	97.0%	0.2813
IC5	Iso Pentane	0.2510	97.0%	0.2435
C6+	Hexanes Plus	0.4380	97.0%	0.4249
Total (GPM)		**8.2400**	**89.0%**	**7.2502**

(1) Oil data from City of Pecos 15 #1

Wolfbone Processing Statement

Percent of Proceeds (POP) 92/92



FINAL STATEMENT

REGENCY GAS SERVICES

PERCENT OF PROCEEDS STATEMENT (FIXED RECOVERY)

REG_SETTLE_GAS_STMT.RPT
Printed: 8/17/2011 4:39:57PM

Cu Pty No: 30837 1
Cu Pty Nm: EAGLE OIL & GAS CO.
Opr No: 30837 1
Opr Nm: EAGLE OIL & GAS CO.

Lease & Contract Information

Plant Name	Gathering System Name	Production Date:	Accounting Date:	Lease Name	Allocation Decimal	Meter Number	State	County	Contract Number	Pressure Base
WAHA		7/2011	7/2011	BALMORHEA RANCH #1	1.0000000	578980984A *	TX	REEVES	0216GGP 0	14.650

Settlement Summary

Keepwhole Volume	Wellhead Gas Value	Residue Value	Product Value	Gross Value	Fees & Adjustments	Total Taxes	Tax Reimbursement	Net Value
0.00	$0.00	$21,019.37	$58,530.98	$79,550.35	$1,591.21	$0.00	$0.00	$77,959.14

Wellhead Information

	MCF	MMBTU:
Gross Wellhead:	7,716.69	10,608.04
Split Decimal:		
Bypass Gas:		
Producer WH:	7,716.69	10,608.04
Inlet		
Net Delivered:	7,176.52	9,865.48

Product Settlement

	Theoretical Gallons	Recovery Fraction	GPM	Allocated Gallons	Shrink	Net % Share	Settlement Volume	Price	Product Value
ETHANE	24,565.23	77.0000	3.4230	18,915.23	1,254.84	92.00	17,402.01	$0.7089	$12,336.38
PROPANE	15,675.67	95.5000	2.1843	14,970.27	1,370.72	92.00	13,772.65	$1.4166	$19,509.81
ISO BUTANE	2,181.66	97.0000	0.3040	2,116.21	210.84	92.00	1,946.92	$1.9415	$3,779.93
NORMAL BUTANE	6,242.14	97.0000	0.8698	6,054.87	628.13	92.00	5,570.48	$1.7676	$9,846.18
PENTANES PLUS	6,222.76	97.0000	0.8671	6,036.08	681.90	92.00	5,553.19	$2.3516	$13,058.68
	54,887.46		7.6482	48,092.66	4,146.43		44,245.24		58,530.98

Residue Allocation

Shrink MMB:	4,146.43	Residue Returned:	0.00
Plant Fuel/Flare/UA MMB:	394.62		

Residue Settlement

Settlement Residue MCF/MMB	Contract %	Price	Residue Value
5,217.41 / 5,524.43	92.00	$4.2910	21,019.37

Taxes

Tax Type	Taxed Quantity	Tax Rate	Tax Due
Total	0.00	0.00	0.00

Fees & Adjustments

	Basis	Rate	Value
GATHERING	10,608.04	$0.1500	$1,591.21
Total	10,608.04		1,591.21

Gas Analysis Information

Components	Mol %	GPM
H2S	0.0000	
Nitrogen	1.1023	
Carbon Dioxide	0.2388	
Other Inerts	0.0000	
Methane	72.0017	
Ethane	12.8145	3.4230
Propane	7.9380	2.1843
Iso Butane	0.9300	0.3040
Nor Butane	2.7623	0.8698
Iso Pentane	0.5976	0.2183
Nor Pentane	0.7148	0.2588
Hexane	0.9000	0.3900
Totals	100.0000	7.6482

Plant Contact

Comments

89.0% Plant Efficiency

Gross Wellhead= 7,717 Mcf

Net Residue: 5,217 Mcf

5,217 Mcf / 7,717 Mcf — 68% Residual

173 bbl/MMcf NGL Yield

Gathering Fee: $0.1500/Mcf

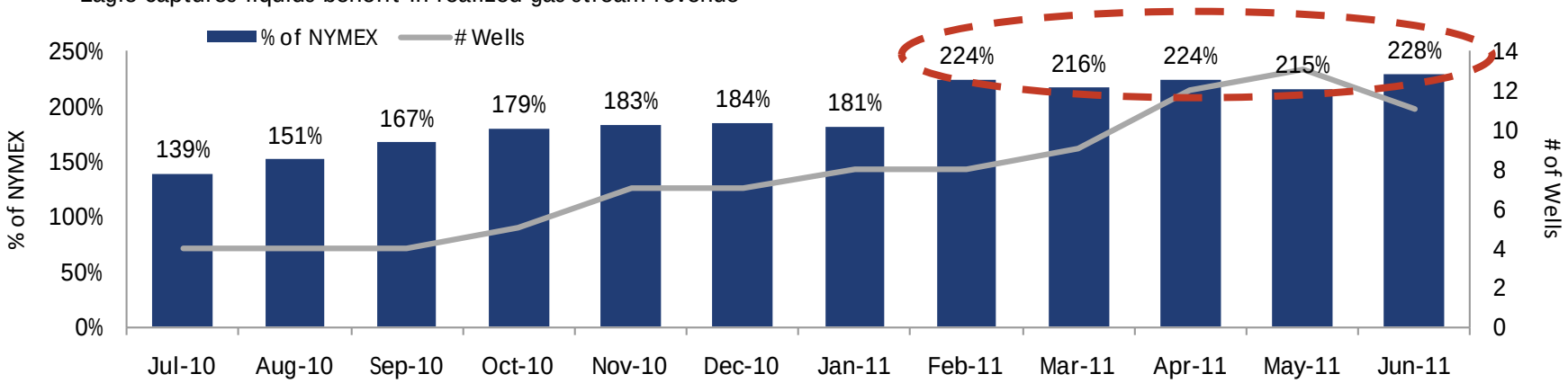
NGLs (theoretical): 7.6482 GPM

Realized Gas Pricing

Actual Historical Gas Pricing

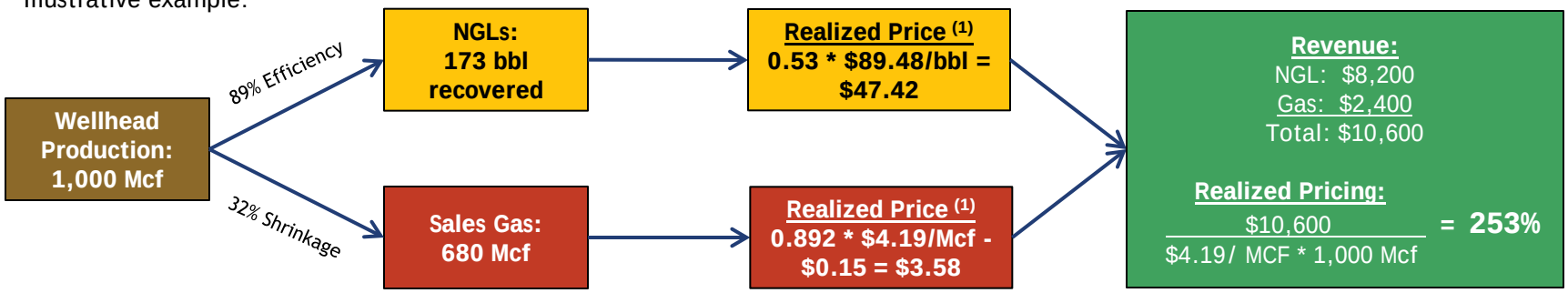
Average 221% realized gas price relative to NYMEX over last 5 mo's

- Eagle captures liquids benefit in realized gas stream revenue



Theoretical Gas Pricing

- NGL extraction not captured in production / sales volumes
- Benefits of liquids content in sales gas modeled with 220% BTU multiplier (i.e., 220% differential)
- Illustrative example:

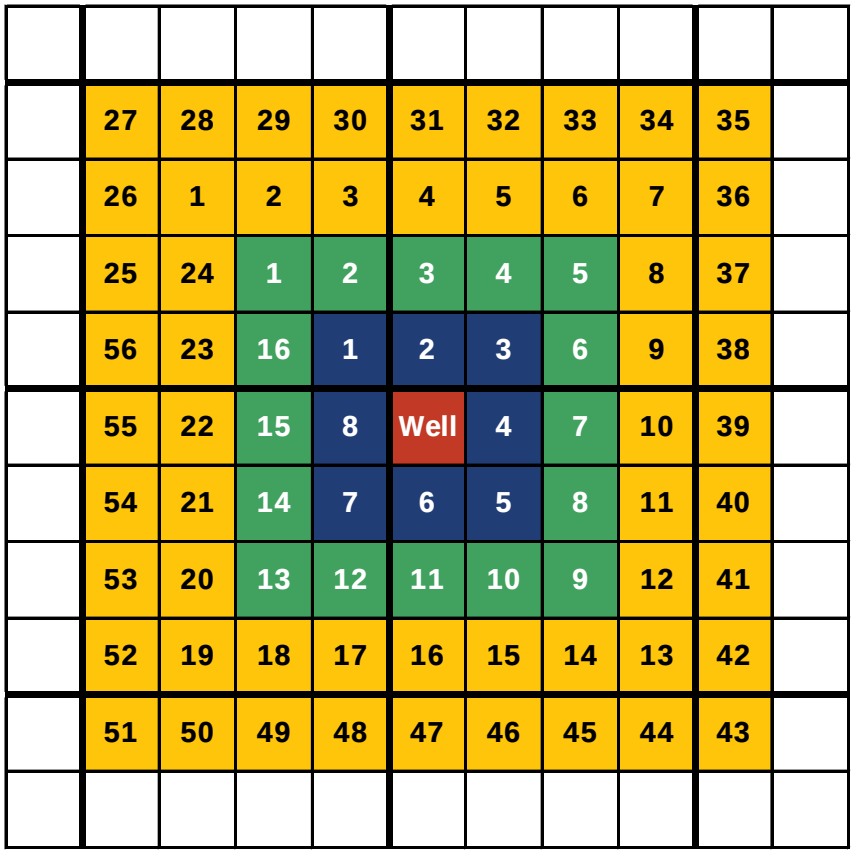


(1) NGL pricing based on WTI, gas pricing based on NYMEX June 2010 – July 2011 before differentials applied to both.

Vertical Development Plan Rapidly Proves Acreage

- Drilling a single vertical well allows an operator to book the following:
  - 1 PDP
  - 8 PUD
  - 16 Probable
  - 56 Possible

  80 total 3P locations
- Using a "fence post" development technique allows an operator to quickly prove an entire field



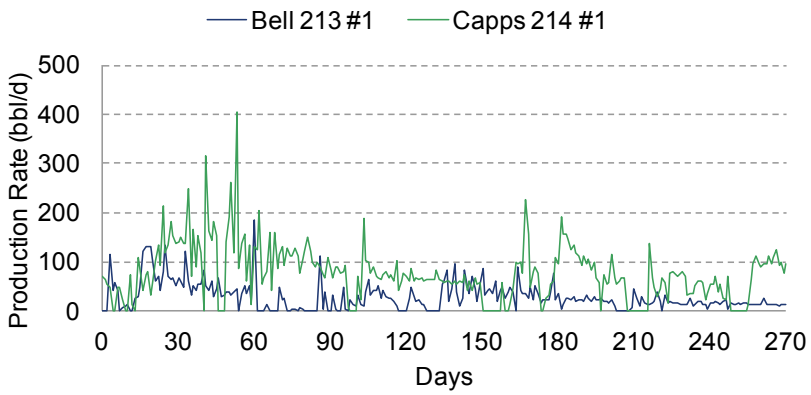
Eagle has already proven a large portion of their acreage → Only 11 wells required to convert 100% of locations to 3P

40-Acre Spacing Works in the Wolfbone

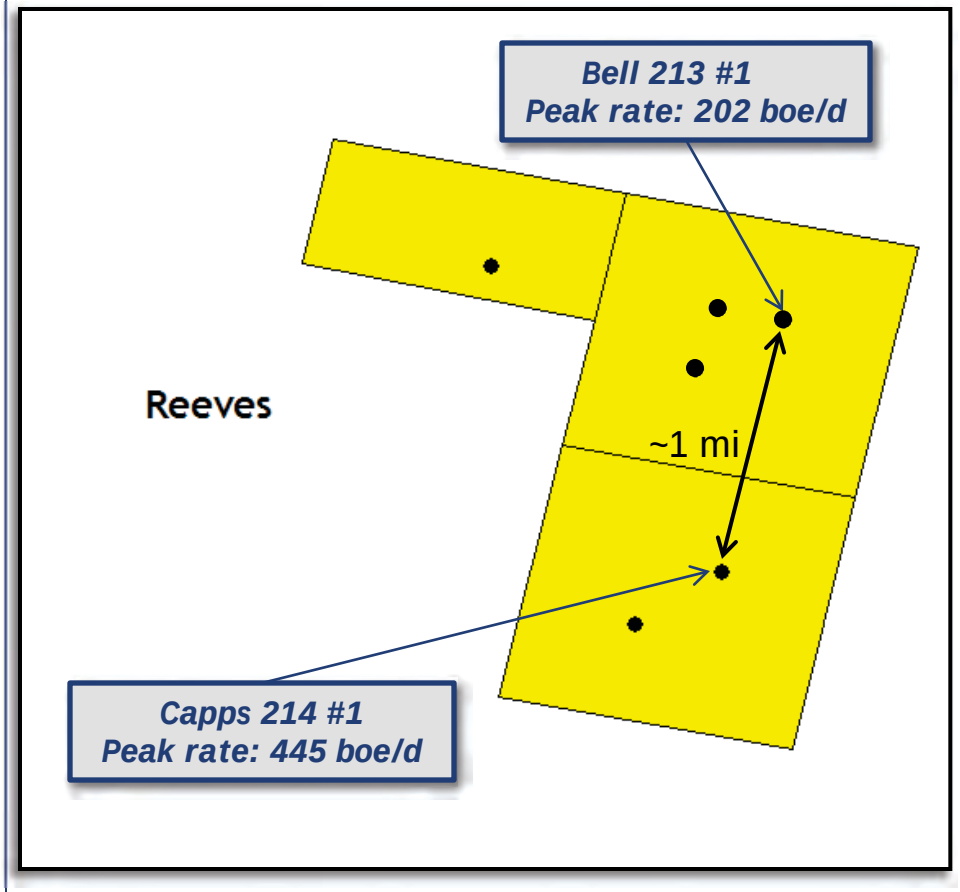
Focused Fracture – Capps 214 #1 Case Study

- Bell 213 #1 completed as a "typical" sandstone
  - Unconcentrated frac targeted sand intervals
    - Wolfcamp Upper and Middle A Shales
    - 3rd Bone Spring Sand
    - *Not completed in Wolfcamp Upper B Shale*
  - Wolfcamp C & D Sands produced excessive water and were plugged
- Capps 214 #1 was completed with a more focused "shale frac"
  - Upper and Middle Wolfcamp Shale
  - Wolfcamp A & B Sand
  - 3rd Bone Spring Sand
  - ***>2x Bell 213 #1 peak production rate***

Same Area – Completely Different Results



Bell/Capps Lease (Southern Area of Eagle Position)



NOTE: Bell 213 #1 was completed in the WC Upr and Mid A shales → but not in the best zone, the WC Upr B shale

40-Acre Spacing Works in the Wolfbone

Wolfbone 40-acre Case Study (Bell Lease)

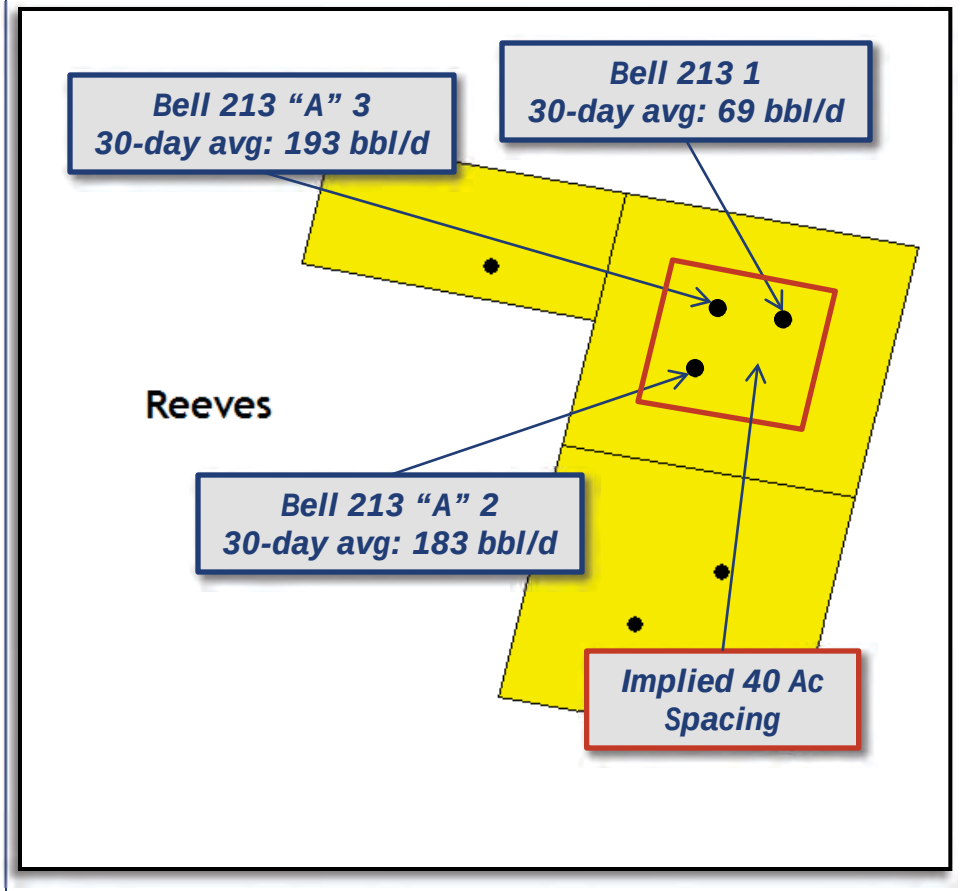
- Bell 213 1, "A" 2, and "A" 3 drilled ~6 months apart
  - 213 1: June 29, 2010
  - 213 "A" 2: Jan 13, 2011
  - 213 "A" 3: May 21, 2011
- No observed interference during completion or production
- Decline rate unaffected by offsetting production
- ***40-acre spacing is norm in the Wolfberry (analog)***
  - ***20-acre development underway in many areas***

Wolfbone Down-Spacing Potential (Recovery Factor)

- Oil-in-Place per sq mile = 108 MMboe

EUR / Well (Mboe)	Well Spacing (acres)		
	40	20	10
200	3.0%	5.9%	11.9%
225	3.3%	6.7%	13.3%
250	3.7%	7.4%	14.8%

Bell Lease (Southern Area of Eagle Position)



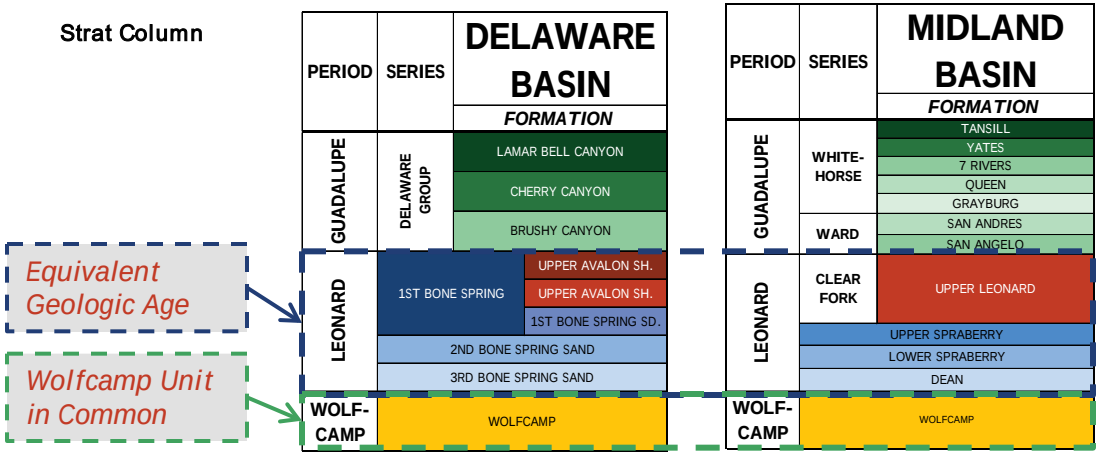
Wolfbone… the Delaware's Wolfberry… only Better

Industry Bringing Midland Basin Technology to the Delaware

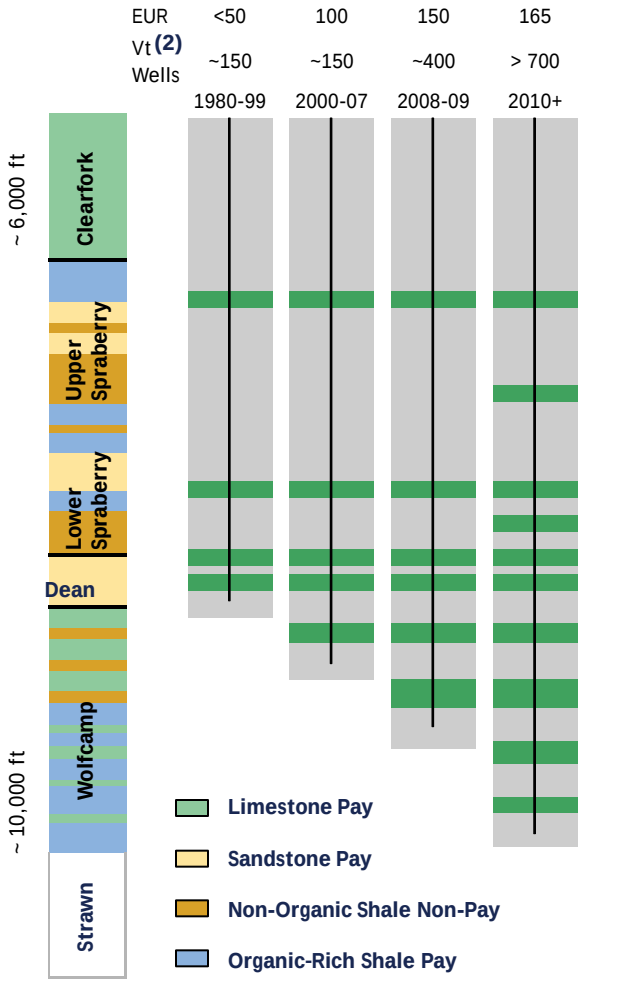
- Industry has increased Wolfberry EUR over time by comingling more zones
  - Activity significantly increased with improved results (now > 700 wells/year)
- Deeper, overpressured Delaware yielding superior Wolfbone EUR vs. Wolfberry
- Wolfbone wells flow 3-6 months before pump (20+ Mbo)

	Wolfbone (Delaware)	Wolfberry (Midland)
Primary Zones	3rd Bone Spring to Wolfcamp	Upr Spraberry to Wolfcamp
Additional Zones	Delaware Sands, Avalon Shale, Deeper zones	Non-traditional shale/silt zones and Deeper Zones *(Strawn, Atoka, Mississippian)*
EUR (Mboe)	240	165
% Liquids	> 80%	~ 65%
Depth (feet)	11,000 - 12,500	7,500 - 11,000
Spacing (acres)	40 acres 1 well will HBP 160 acres	40 acres (current), testing on 20

Strat Column



Wolfberry Evolution Through Technology(1)



(1) Chart adapted from Pioneer Natural Resources.
(2) Approximate yearly average.

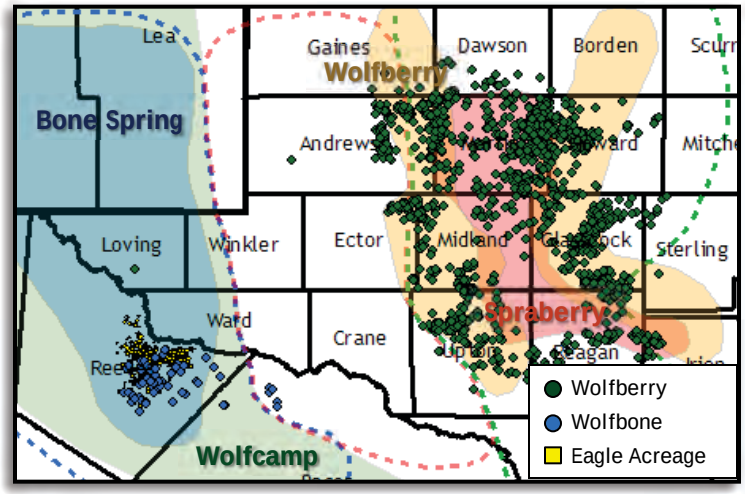
Wolfberry vs. Wolfbone

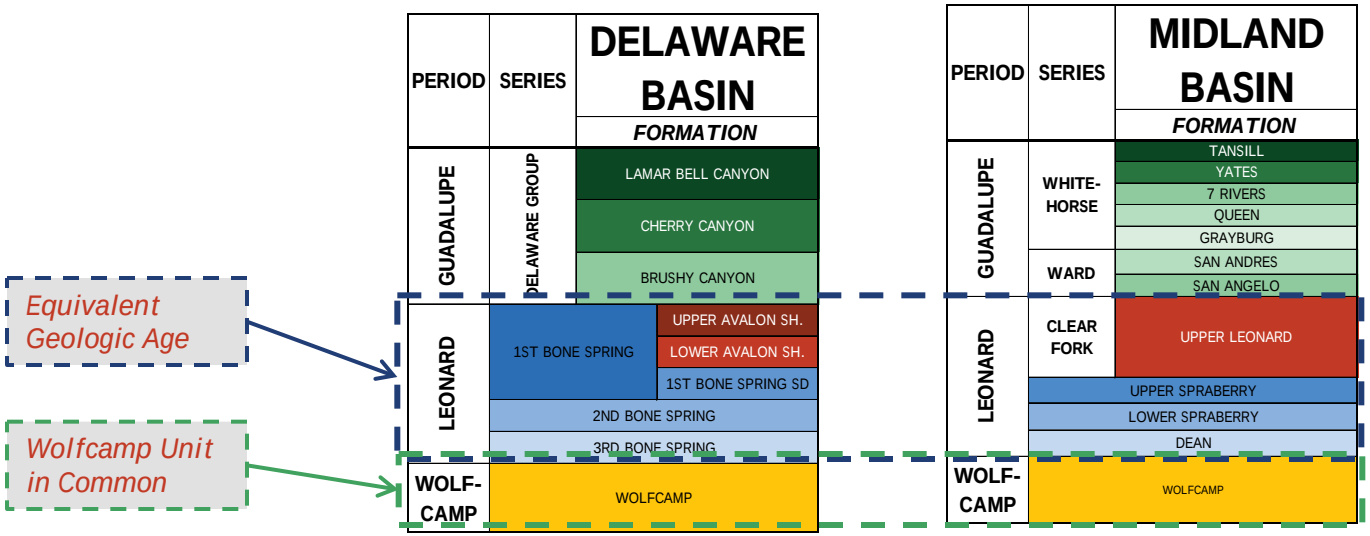
Wolfbone has Superior Reservoir Properties

- Depth and Pressure → Greater Reservoir Energy
  - Wolfbone is highly overpressured (~ 0.7 psi/ft)
  - Wolfbone is ~ 2,000' deeper
  - ***Wolfbone up to 2x Wolfberry pressure***
- Thicker vertical section leads to additional upside
  - Both completed over 1,250' interval
  - Wolfbone has 2,000' additional potential
- Substantial upside in the Delaware Basin
  - Uphole potential in Delaware Sands
  - Hz develoment

Wolfbone Well Count is Quickly Growing

STUDY AREA





Map source: HPDI. Wolfberry wells drilled since 1/1/2010

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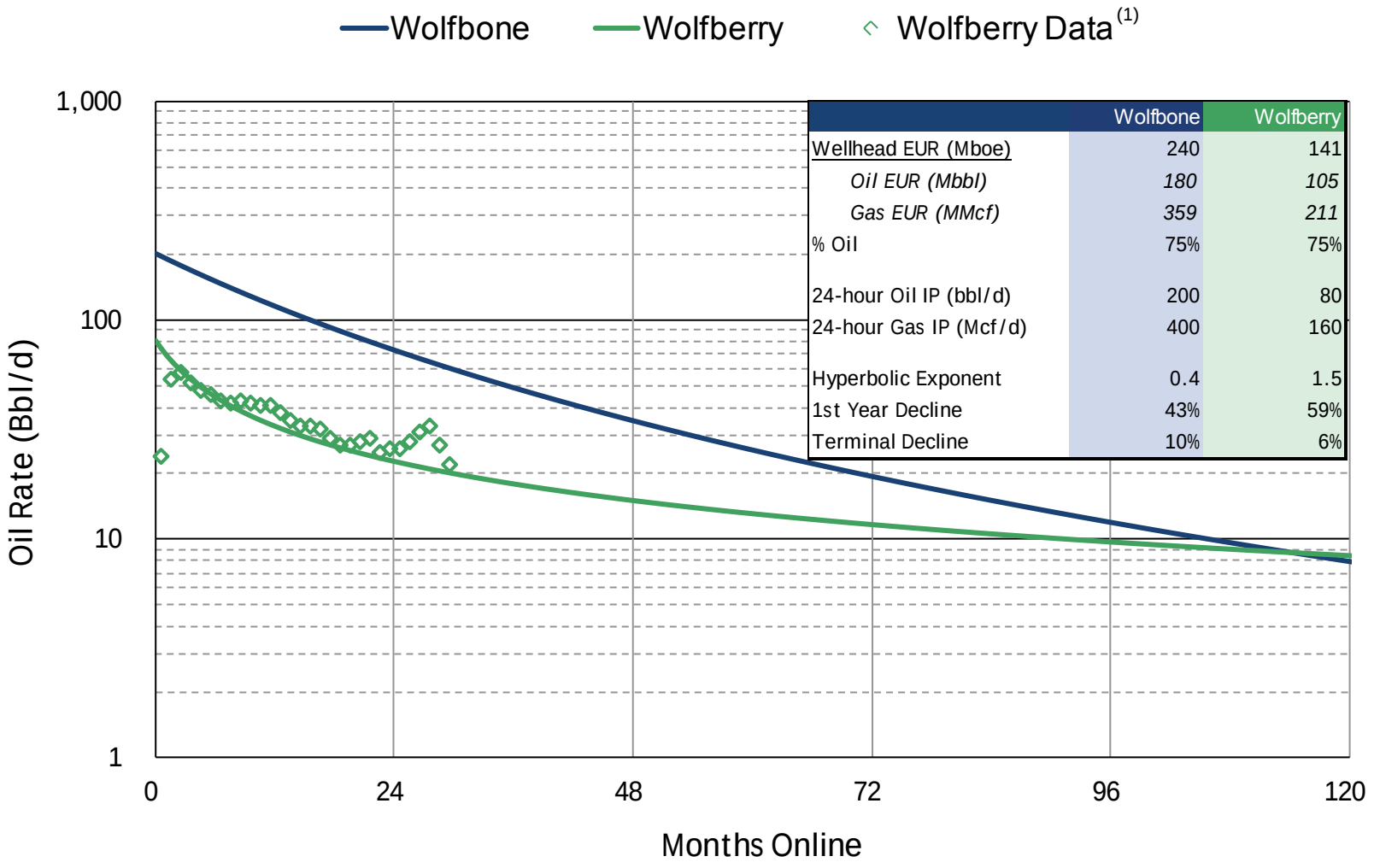
Wolfbone Type Curve (vs. Wolfberry)



	Wolfbone	Wolfberry
Wellhead EUR (Mboe)	240	141
Oil EUR (Mbbl)	*180*	*105*
Gas EUR (MMcf)	*359*	*211*
% Oil	75%	75%
24-hour Oil IP (bbl/d)	200	80
24-hour Gas IP (Mcf/d)	400	160
Hyperbolic Exponent	0.4	1.5
1st Year Decline	43%	59%
Terminal Decline	10%	6%

GOR (scf/stb): 2,000

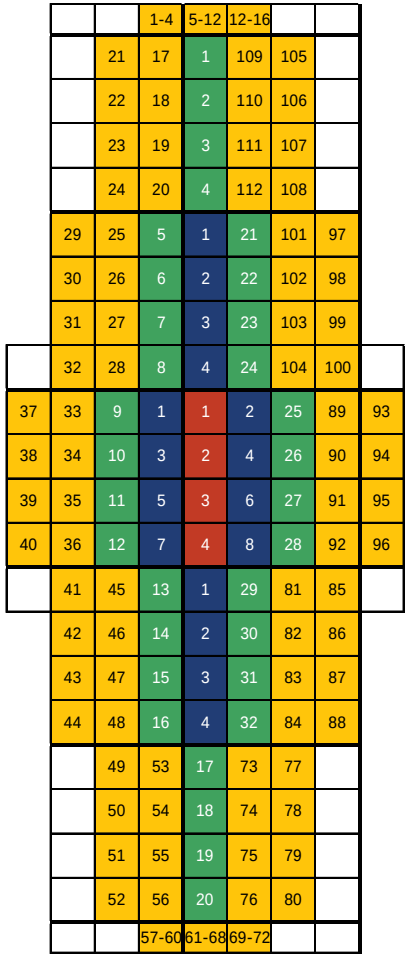
(1) 2009+ vintage Wolfberry completions.

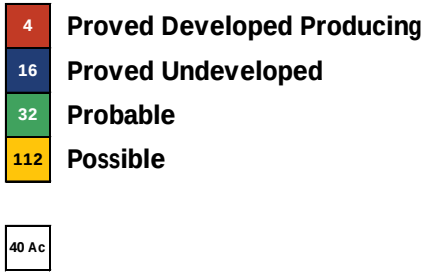
SEC Rules Favor Horizontal Well Development

- Drilling a single horizontal well allows an operator to book the following:
  - 1 PDP (4 x 40 Ac)
  - 4 PUD (16 x 40 Ac)
  - 8 Probable (32 x 40 Ac)
  - 28 Possible (112 x 40 Ac)

  40 total Hz 3P locations

- Horizontal wells are being used to prove fields quickly in North Dakota using the "fence post" development plan
- 2009 SEC booking guideline changes made proving reserves with horizontal wells more favorable to operators
- Old method: Only direct lateral offsets
- New method: Includes toe+ heel offsets



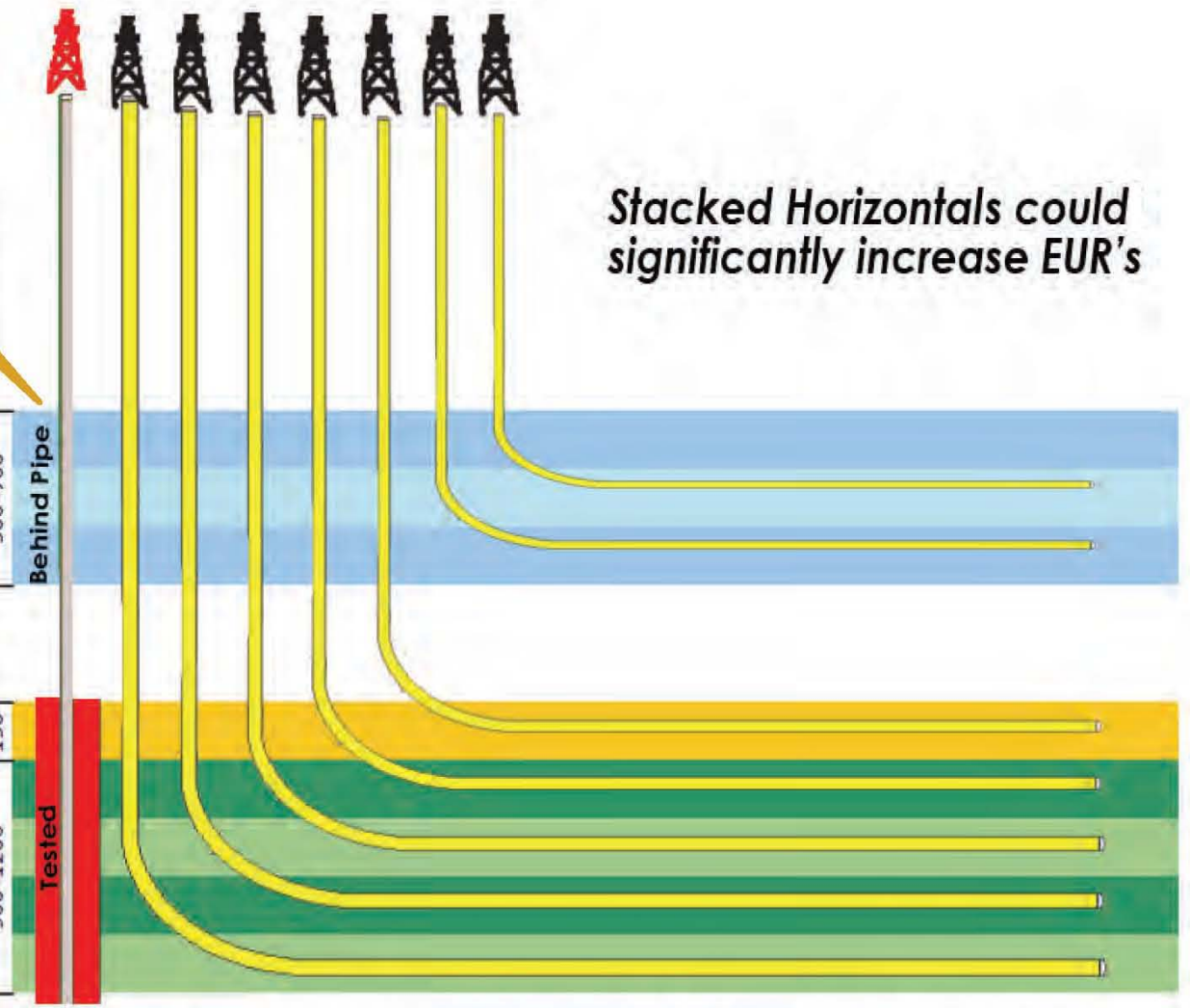


Eagle is currently completing their first Wolfcamp Shale horizontal well

* Courtesy of Carrollton Minerals Partners

Avalon –
- ~800' thick.
- 105 MMboe in-place per sq. mile

Period		Unit	~ Depth	
Permian	Guadalupian	Bell Canyon		
		Cherry Canyon		
		Brushy Canyon		
	Leonardian	Upper Avalon Shale	8,800	500'-700'
		Lower Avalon Shale		
		1st Bone Spring Sand		
		2nd Bone Spring Shale Upr	9,600	
		2nd Bone Spring Shale Lwr	9,850	
		3rd Bone Spring	10,150	150'
	Wolfcampian	Upr Wolfcamp Shale A	10,440	900'-1200'
		Upr Wolfcamp Shale B	10,700	
		Mid Wolfcamp Shale A	10,900	
		Mid Wolfcamp Shale B	11,100	
		Md Wolfcamp Sand A	11,650	
		Md Wolfcamp Sand B	12,000	
		Md Wolfcamp Sand C	12,250	



Stacked Horizontals could significantly increase EUR's

Stacked pay Verticals producing in 3rd Bone - Wolfcamp series

Wolfbone Vertical –
- ~1200' thick.
- 108 MMboe in-place per sq. mile

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Going Sideways to Get Ahead

Horizontals in the Delaware

- Operators have been developing the 3rd Bone Spring with horizontal wells
  - Capture more acreage than vertical wells
  - More stimulated rock volume leads to higher rates
  - Larger drainage area leads to greater ultimate recovery
- Thick sections perfect for horizontal development
  - 2+ laterals per unit (Bone Spring, Wolfcamp, Avalon)
  - More laterals increases recovery factor per section

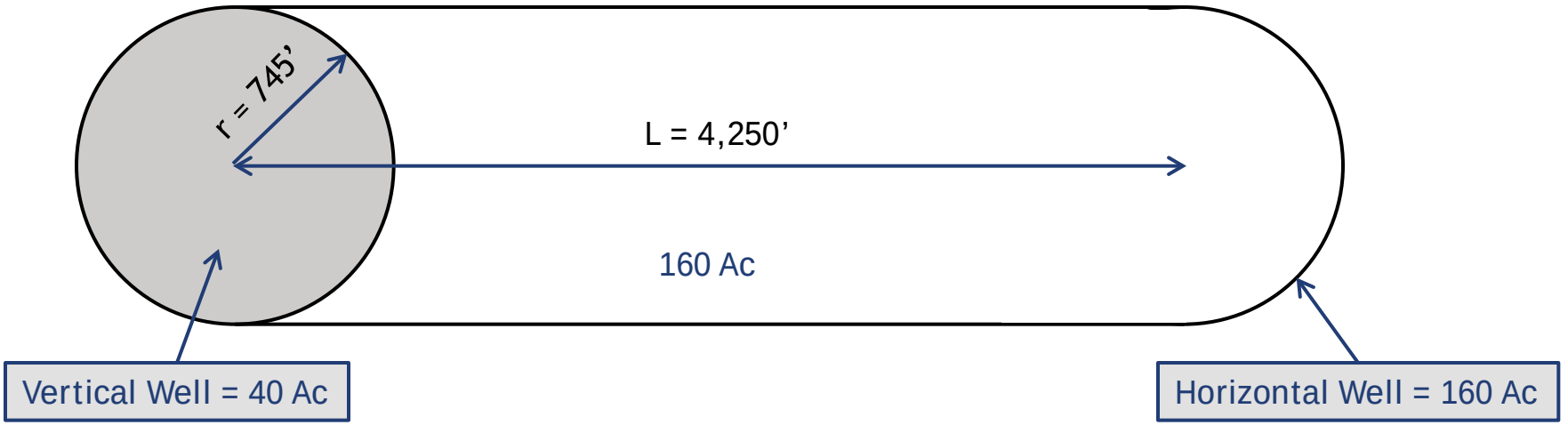
Horizontal Wells consistently Outperform Vertical

- Vertical to Horizontal EUR factor:

Play	EUR Multiplier
Bakken	3 - 5x
Eagle Ford	5 - 7x
Granite Wash	4 - 5x
Miss Lime	3 - 4x
Niobrara	6 - 8x
Wolfcamp (Midland)	5 - 6x
Wolfcamp (Delaware)	3x

Average ~ 5x

Vertical vs. Horizontal Drainage Area



Source: CHK IR presentation. TPH internal research.

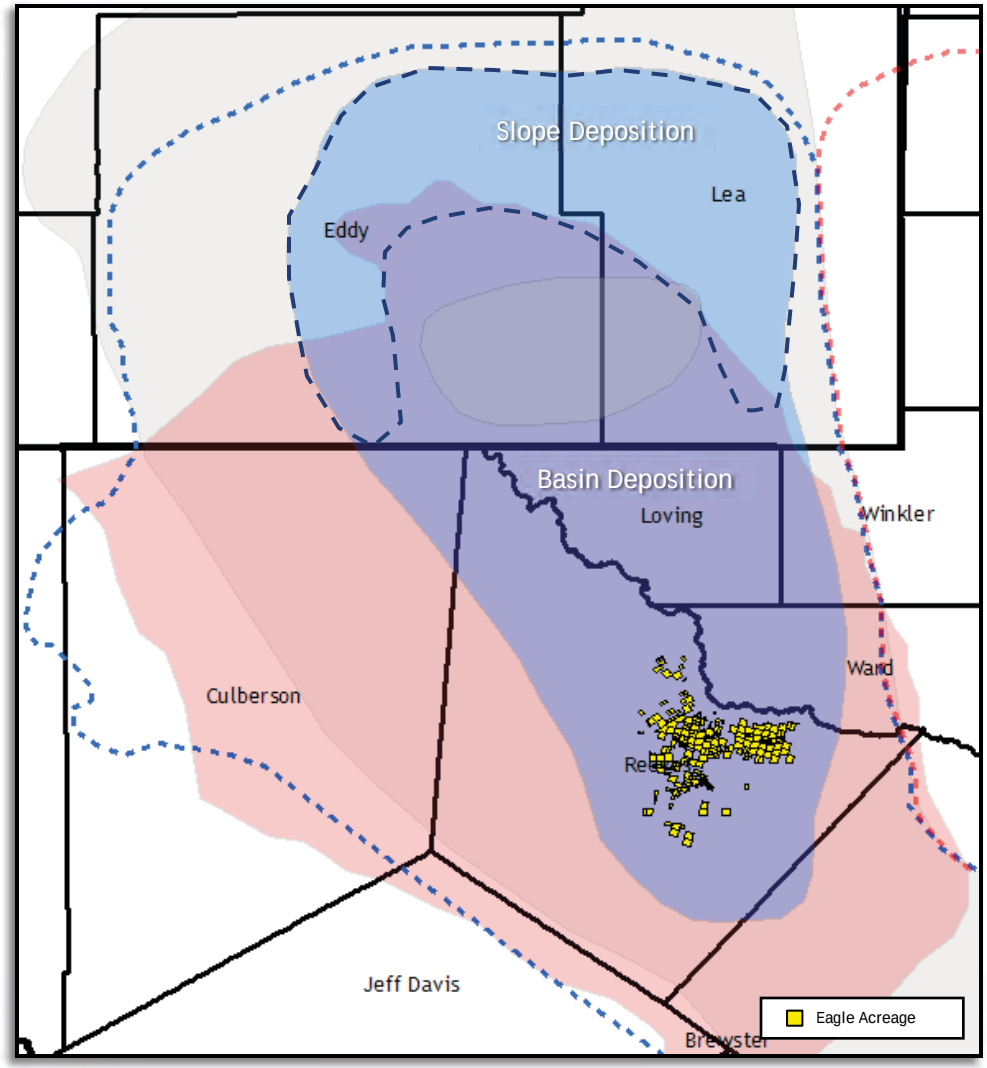
Bone Spring Play

Bone Spring Geologic Characterization

- The Bone Spring formation consists of 3 distinct members (deepest to shallowest):
  - 3rd Bone Spring (primary target in Reeves/Ward and Northern Eddy/Lea)
  - 2nd Bone Spring (Northern Eddy/Lea)
  - 1st Bone Spring /Avalon Shale (center basin)
- 3rd Bone Spring Sand widely distributed across basin
  - Primary target for hz development
  - Consists of 6 distinct sand facies (Hoban, A, B, C, D, E)
  - 5-10' thick and 14% porosity
  - Normally pressured – contributes to long-life production capacity of Wolfbone wells

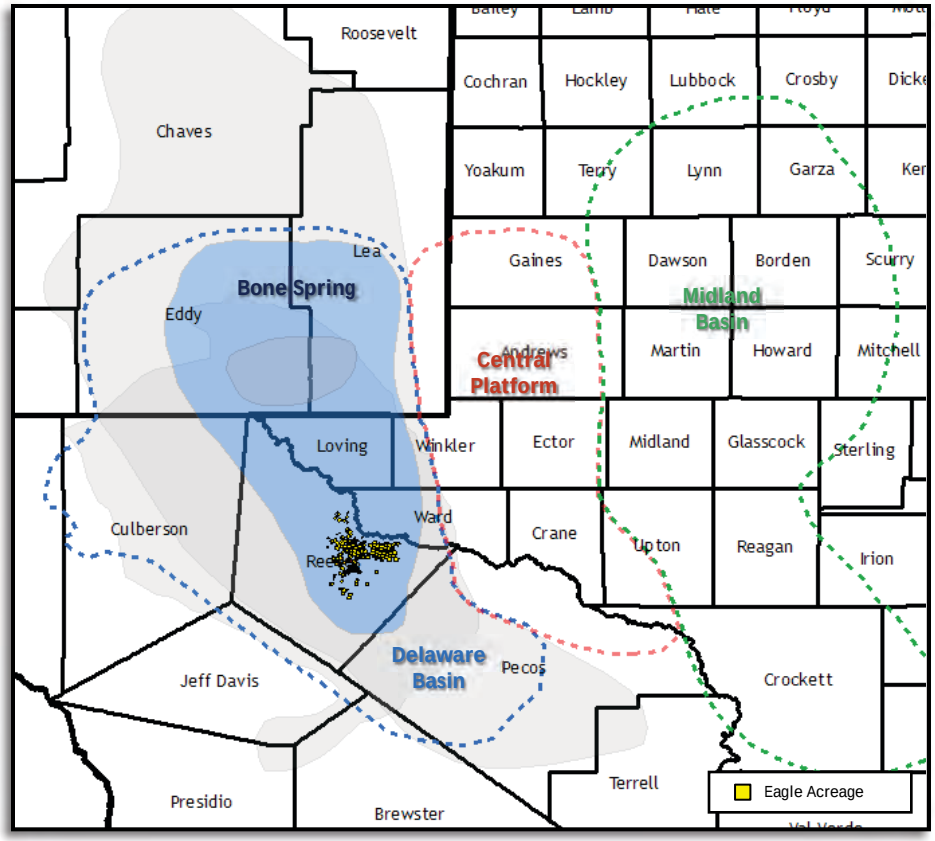
1st Bone Spring Sand – Turbidite Channels

- 1st Bone Spring member below Avalon Shale contains turbidite channel facies in several areas
  - Similar to productive GoM turbidite channel reservoirs



Bone Spring

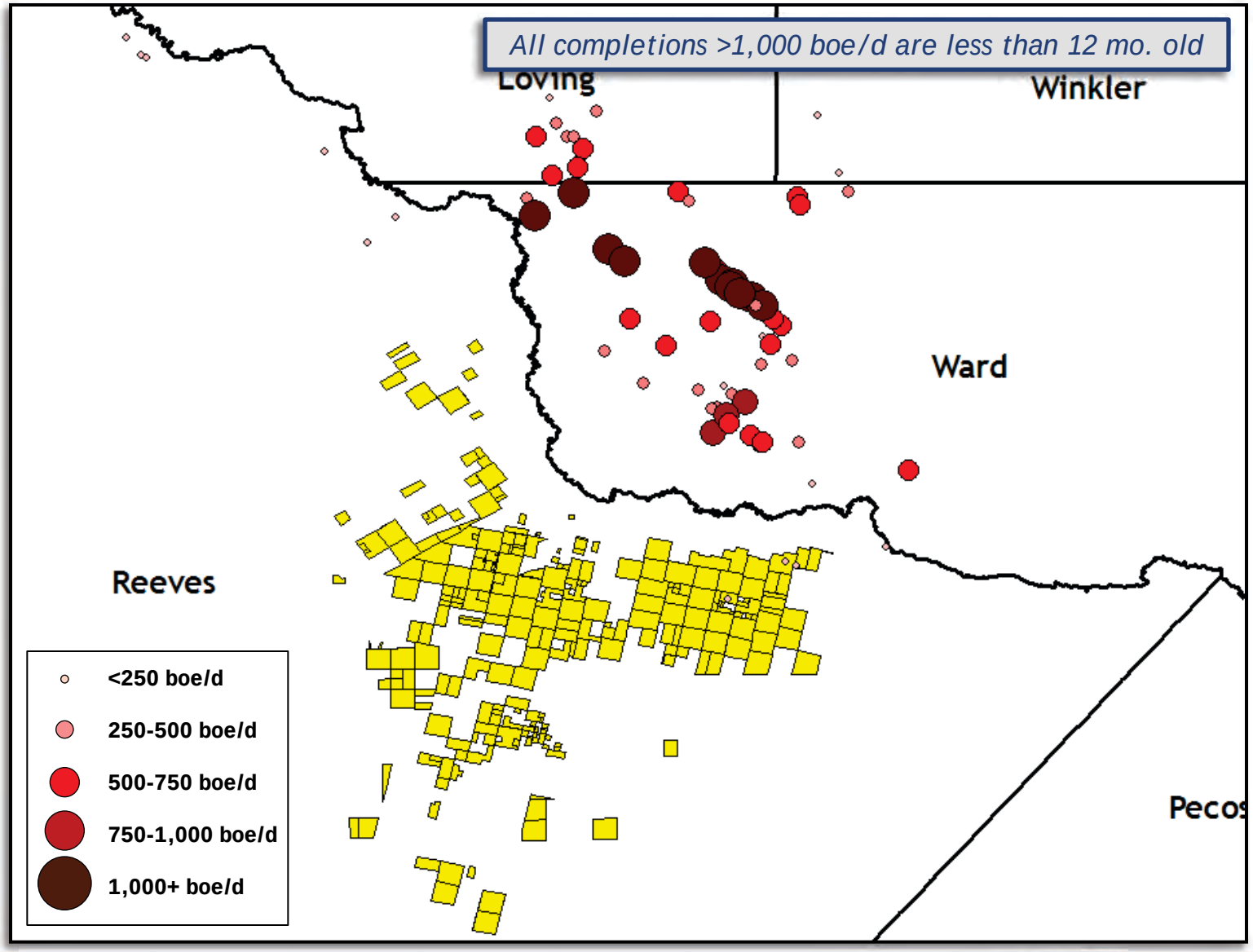
Bone Spring Depositional Area



PERIOD	SERIES	DELAWARE BASIN
		FORMATION
QUATERNARY / TERTIARY		ALLUVIUM
CRETACEOUS	GULFIAN	
	COMAN-CHEAN	FREDERICKSBURG
		TRINITY SD.
	UPPER	SANTA ROSA
PERMIAN	OCHOAN	DEWEY LAKE
		RUSTLER
		SALDO
		CASTILLE
	GUADALU-PIAN	DE SANDS: BELL CANYON
		CHERRY CANYON
		BRUSHY CANYON
	LEONARDIAN	1ST BONE SPRING: UPPER AVALON SH.
		1ST BONE SPRING: LOWER AVALON SH.
		1ST BONE SPRING SD.
		2ND BONE SPRING
		3RD BONE SPRING
	WOLFCAMPIAN	WOLFCAMP
Pennsylvanian	VIRGIL	CISCO
	MISSOURI	CANYON
	DES MOINES	STRAWN
	ATOKA	ATOKA
	MORROW	MORROW

The Bone Spring package exists across much of the Delaware Basin though different members are more prevalent in specific areas

Hz Bone Spring IP Bubble Map



Wells completed as Wolfbone producers after 1/1/2009 – Hoban, Wolf

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Bone Spring Industry Activity

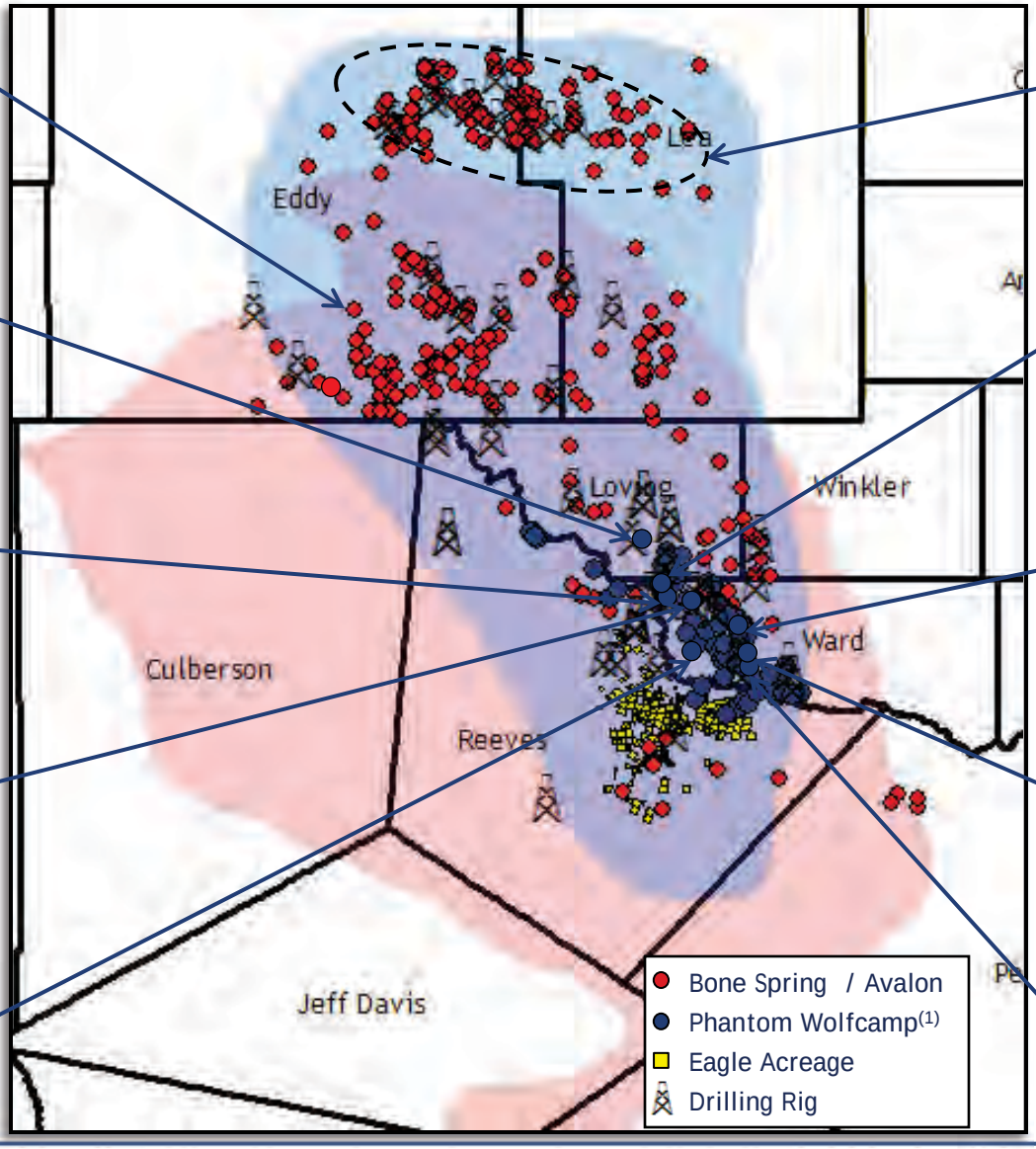
Bone Spring
Concho
Morning Fed. 1H
Test: 700 boe/d

Bone Spring
Chesapeake
Johnson 1-86
30-day: 920 boe/d

Bone Spring
Chesapeake
Crockett 1-26 1H
IP rate: 2,445 boe/d

Bone Spring
Chesapeake
Monroe 1-17 1H
30-day: 1,475 boe/d

Bone Spring
Anadarko
Blacktip Johnson 1-39H
30-day: 920 boe/d



Bone Spring
Cimarex Activity:
7 wells with reported IPs between 560-1,100 boe/d
Avg rate ~856 boe/d

Bone Spring
Devon
Talladega 65 1H
30-day: 1,281 boe/d

Bone Spring
Chesapeake
Monroe 34-220
30-day: 1,345 boe/d

Bone Spring
Cimarex
KHC '33-26'
30-day: 1,226 boe/d

Bone Spring
Cimarex
Davis '33-20'
30-day: 1,293 boe/d

(1) 3rd Bone Spring horizontal wells listed in HPDI as Phantom field, W

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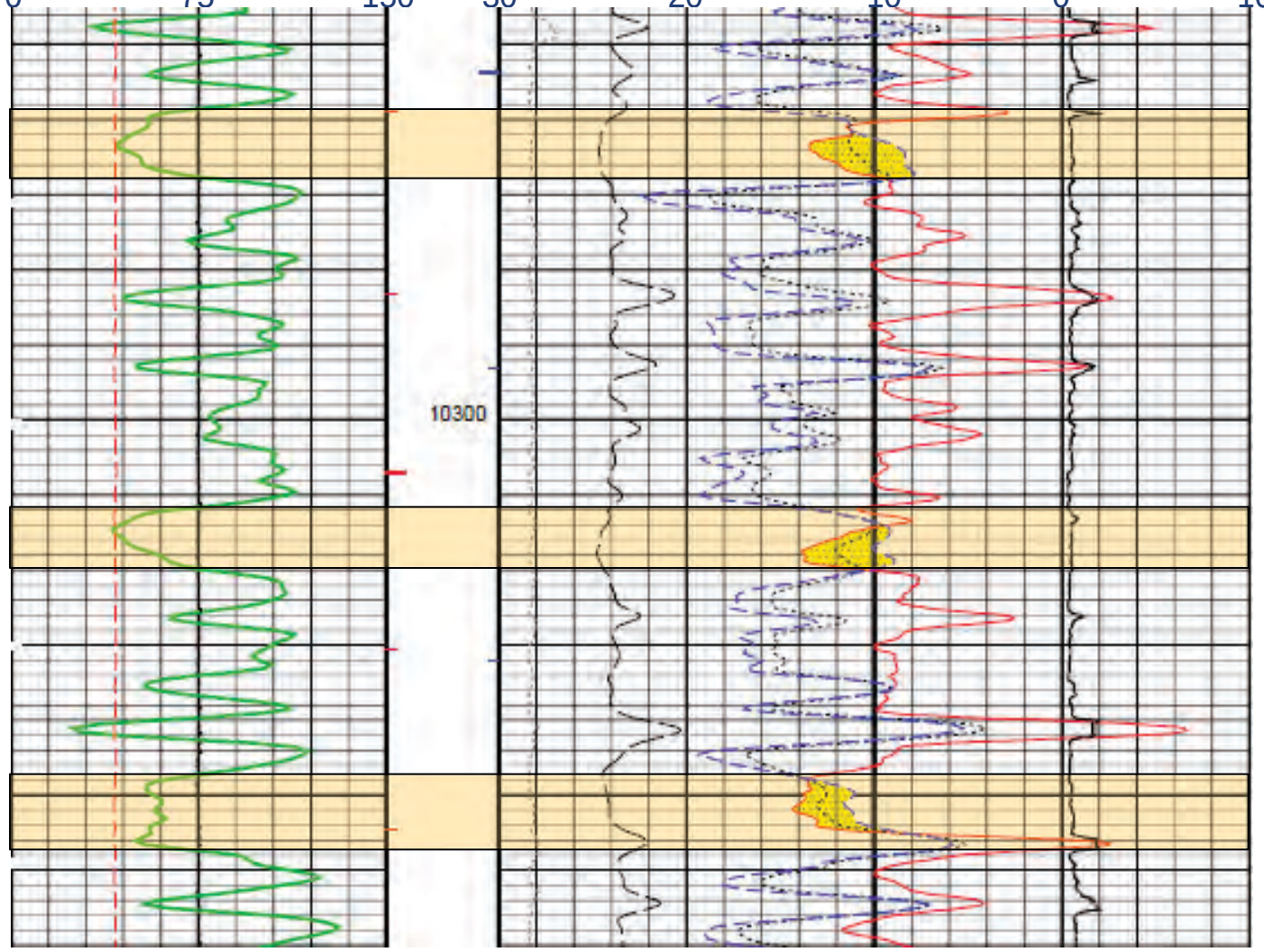
Bone Spring Type Log Section

Full logs available on VDR



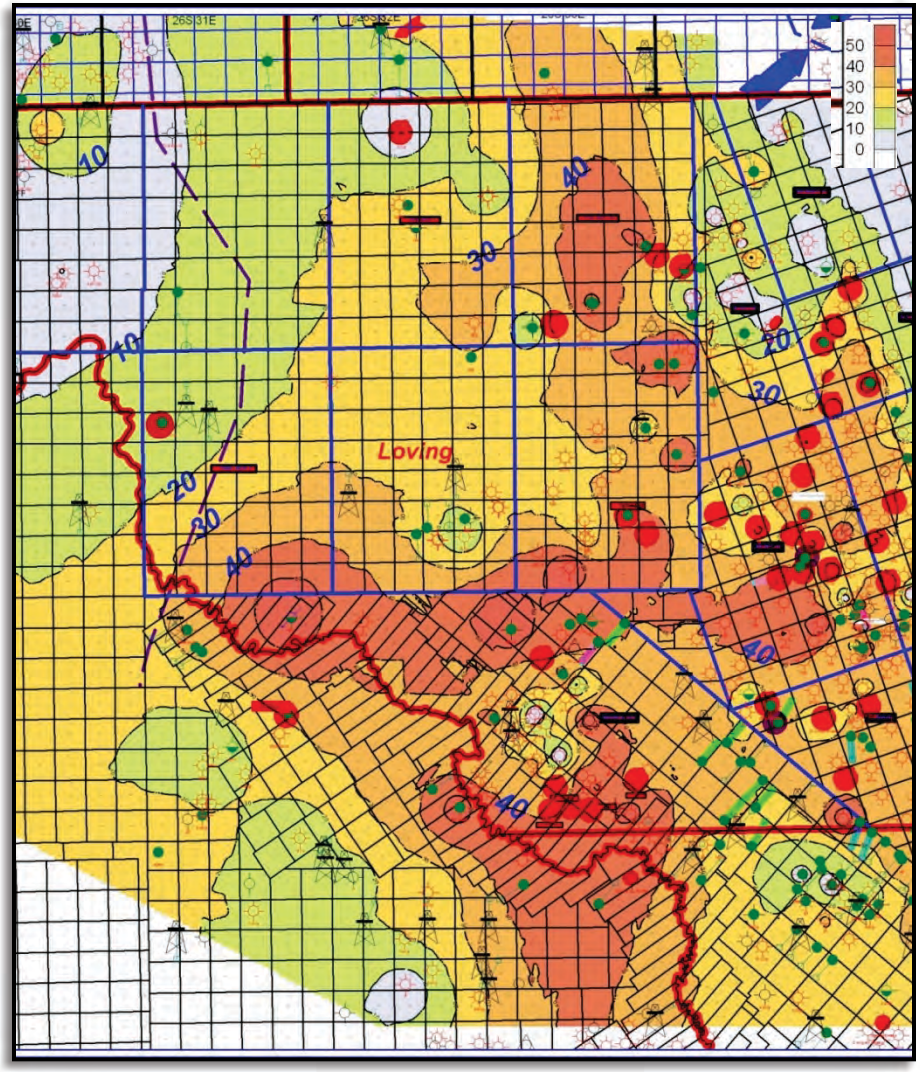
3rd Bone Spring Sands Net Isopach

Map Parameters

- Color contours are 10 feet (max = 50+ feet)
- Net Feet>12% Porosity
- Reeves = up to 50'
- Mudlog shows in red (from public data)

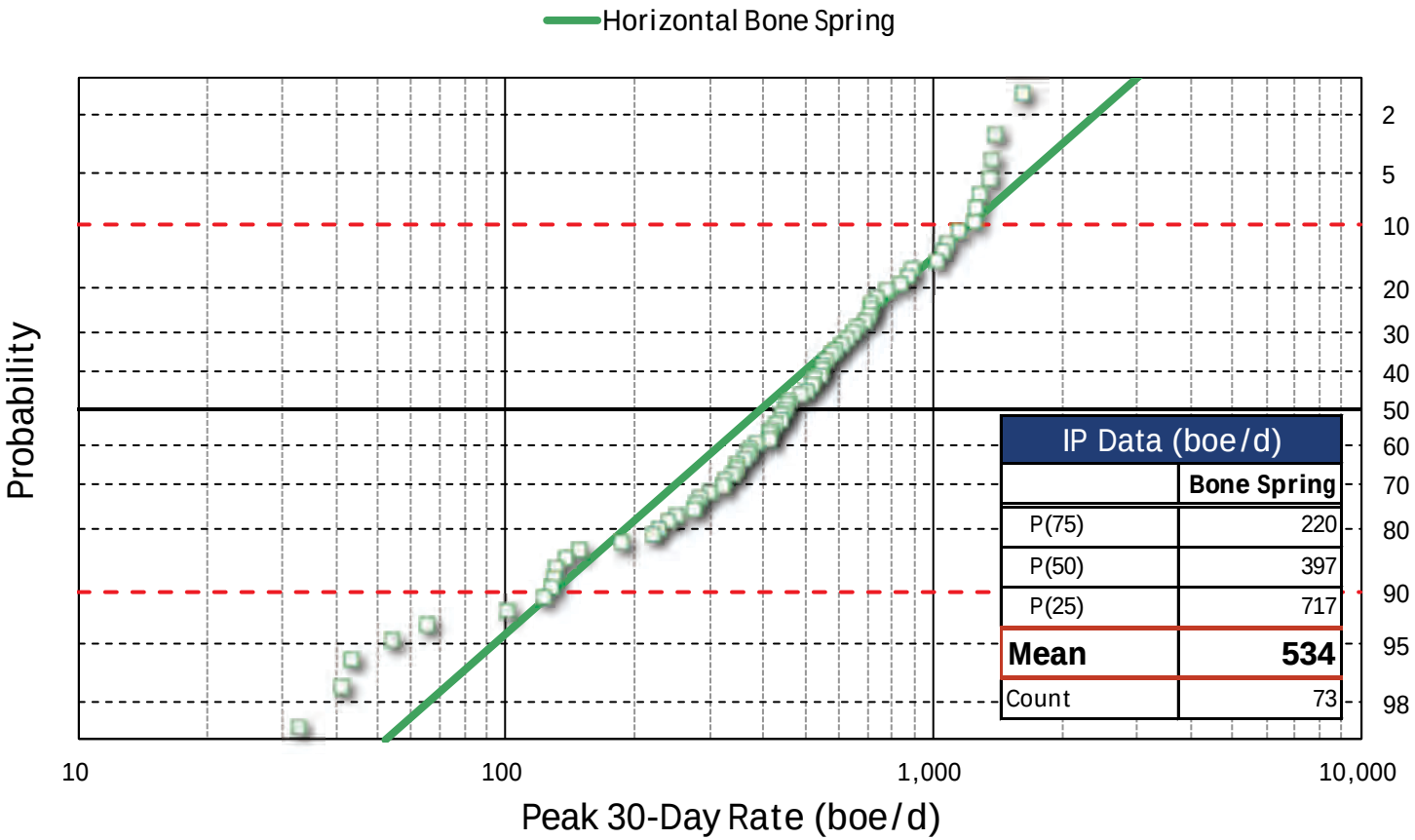
Summary Observations

- Max net thickness on Reeves / Ward / Loving border
- Potential for comingling in vertical wells or targeting with horizontals



Source: Net isopach map from John Worrall (Geologist and Partner, Bold Energy II, LLC and Manzano Energy Partners), and Chad Kronkosky (Reservoir Engineer, Bold Energy II, LLC).

Hz Bone Spring IP Rate



15 wells deviating from a standard lognormal distribution were removed from the dataset.

Bone Spring Fluid Analysis (Chevy 17 #1)

Gas Compositional Analysis

Component		Mole (%)	GPM
H2S	Hydrogen Sulfide	0.019	
N2	Nitrogen	1.096	
CO2	Carbon Dioxide	0.219	
C1	Methane	73.982	
C2	Ethane	11.454	3.059
C3	Propane	7.352	2.023
NC4	n-Butane	2.699	0.850
IC4	Isobutane	0.887	0.290
NC5	n-Pentane	0.684	0.248
IC5	Isopentane	0.597	0.218
C6+	Hexanes Plus	1.012	0.438
Total		**100.000**	**7.126**

Plant Statement Gas Analysis

		Theoretical	Plant Recovery (%)	Actual (GPM)
C2	Ethane	3.0591	70.0%	2.1414
C3	Propane	2.0227	95.5%	1.9317
NC4	Normal Butane	0.8498	97.0%	0.8243
IC4	Iso Butane	0.2897	97.0%	0.2810
NC5	Normal Pentane	0.2478	97.0%	0.2404
IC5	Iso Pentane	0.2180	97.0%	0.2115
C6+	Hexanes Plus	0.4384	97.0%	0.4252
Total (GPM)		**7.1255**	**87.0%**	**6.0554**

144 bbl/MMcf Recovered
Range: 123 - 177 bbl/MMcf

Bone Spring Processing Statement

POP : 92/92

FINAL STATEMENT

REGENCY

PERCENT OF PROCEEDS STATEMENT (FIXED RECOVERY)

REG_SETTLE_GAS_STMT.RPT
Printed: 7/15/2011 4:51:21PM

Cu Pty No: 10837 1
Cu Pty Nm: EAGLE OIL & GAS CO
Opr No: 10837 1
Opr Nm: EAGLE OIL & GAS CO

Lease & Contract Information

Plant Name	Gathering System Name	Production Date:	Accounting Date:	Lease Name	Allocation Decimal	Meter Number	State	County	Contract Number	Pressure Base
WAHA		6/2011	6/2011	CHEVY #1	1.0000000	578980585 *	TX	REEVES	0188PUR 0	14.650

Settlement Summary

Keepwhole Volume	Wellhead Gas Value	Residue Value	Product Value	Gross Value	Fees & Adjustments	Total Taxes	Tax Reimbursement	Net Value
0.00	$0.00	$2,885.22	$6,789.10	$9,674.31	$0.00	$0.00	$0.00	$9,674.31

Wellhead Information

	MCF:	MMBTU:
Gross Wellhead:	973.96	1,321.33
Split Decimal:		
Bypass Gas:		
Producer WH:	973.96	1,321.33
Inlet		
Net Delivered:	915.52	1,242.05
BTU As Del:	1.3567	
BTU Dry:	1.3567	
BTU Wet:	1.3327	

Product Settlement

	Theoretical Gallons	Recovery Fraction	GPM	Allocated Gallons	Shrink	Net % Share	Settlement Volume	Price	Product Value
ETHANE	2,800.67	70.0000	3.0591	1,960.47	130.06	92.00	1,803.63	$0.6518	$1,175.56
PROPANE	1,851.82	95.5000	2.0227	1,768.49	161.93	92.00	1,627.01	$1.4127	$2,298.45
ISO BUTANE	265.23	97.0000	0.2897	257.27	25.63	92.00	236.69	$1.8831	$445.71
NORMAL BUTANE	778.01	97.0000	0.8498	754.67	78.29	92.00	694.30	$1.7164	$1,191.71
PENTANES PLUS	827.81	97.0000	0.9042	802.98	90.61	92.00	738.74	$2.2710	$1,677.66
	6,523.54		7.1255	5,543.88	486.52				

Plant Fuel/Flare/UA MMB: 49.68

Residue Returned: 0.00

Residue Settlement

Settlement Residue MCF/MMB	Contract %	Price	Residue Value
686.49 / 75.86	92.00	$4.4430	2,885.22

Taxes

Tax Type	Taxed Quantity	Tax Rate	Tax Due
Total	0.00	0.00	0.00

Fees & Adjustments

	Basis	Rate	Value
Total	0.00		0.00

Gas Analysis Information

Components	Mol %	GPM
H2S	0.0190	
Nitrogen	1.0964	
Carbon Dioxide	0.2186	
Other Inerts	0.0000	
Methane	73.9817	
Ethane	11.4539	3.0591
Propane	7.3516	2.0227
Iso Butane	0.8865	0.2897
Nor Butane	2.6992	0.8498
Iso Pentane	0.5969	0.2180
Nor Pentane	0.6844	0.2478
Hexane	1.0118	
Totals	100.0000	7.1255

Plant Contact

Comments

87.0% Plant Efficiency

Net Residue: 686 Mcf

Gross Wellhead= 974 Mcf

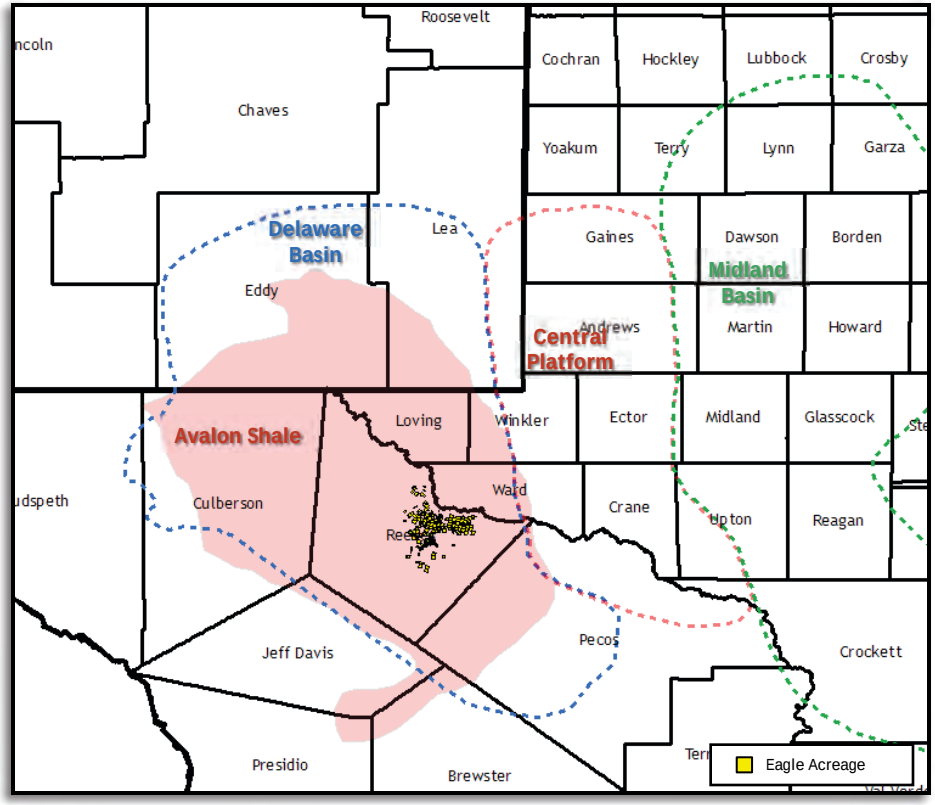
686 Mcf / 974 Mcf — 70% Residual

144 bbl/MMcf NGL Yield

Theoretical NGLs: 7.1255 GPM

Avalon Shale

Avalon Shale Depositional Area



PERIOD	SERIES	DELAWARE BASIN FORMATION		
QUATERNARY / TERTIARY		ALLUVIUM		
CRETACEOUS	GULFIAN			
	COMAN-CHEAN	FREDERICKSBURG		
		TRINITY SD.		
	UPPER			SANTA ROSA
PERMIAN	OCHOAN	DEWEY LAKE		
		RUSTLER		
		SALDO		
		CASTILLE		
	GUADALU-PIAN	DE SANDS	BELL CANYON	
			CHERRY CANYON	
			BRUSHY CANYON	
	LEONARDIAN	1ST BONE SPRING		UPPER AVALON SH.
				LOWER AVALON SH.
				1ST BONE SPRING SD.
		2ND BONE SPRING		
		3RD BONE SPRING		
	WOLFCAMPIAN	WOLFCAMP		
Pennsylvanian	VIRGIL	CISCO		
	MISSOURI	CANYON		
	DES MOINES	STRAWN		
	ATOKA	ATOKA		
	MORROW	MORROW		

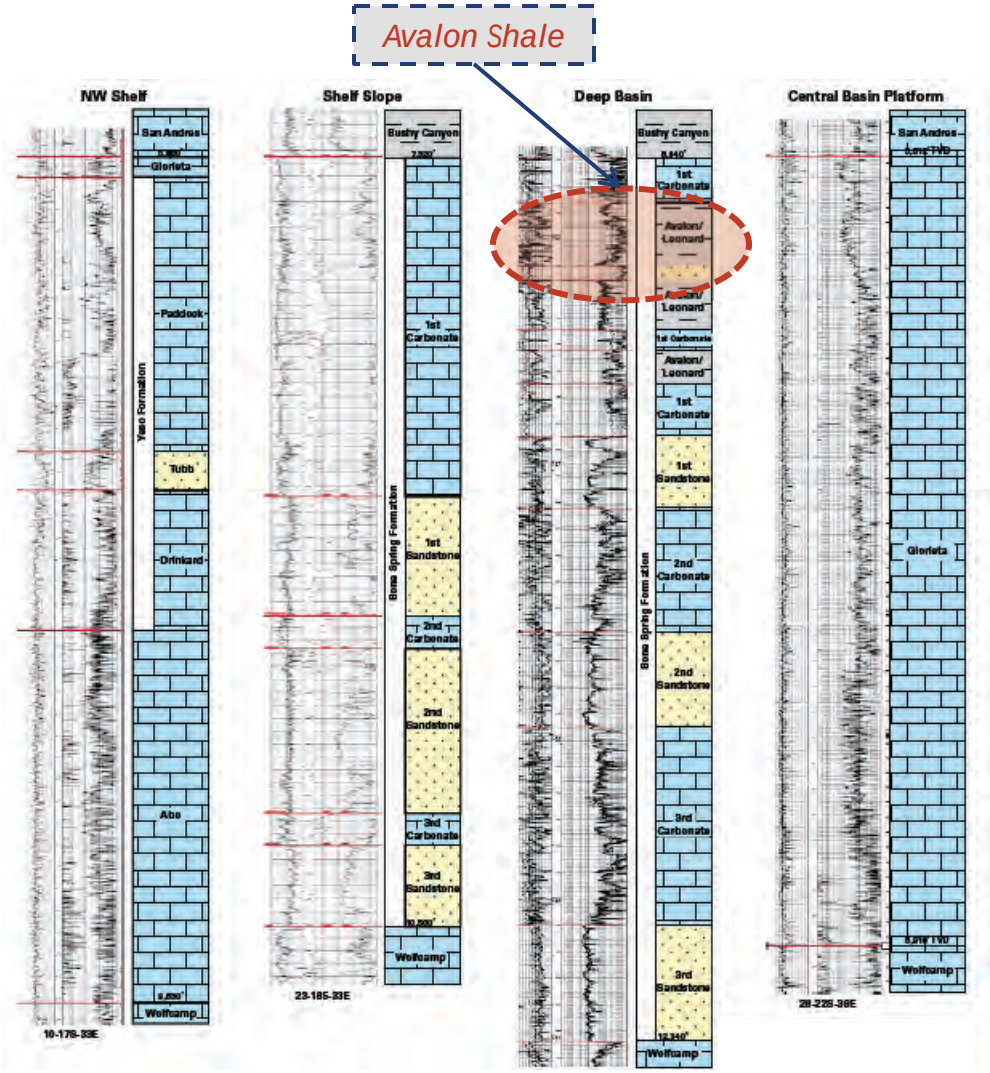
The Avalon Shale is present throughout the Delaware basin and is currently being pursued as an unconventional play in the Northern half

What is the Avalon Shale?

The Avalon Shale is the stratigraphic interval between the top of the Bone Spring formation & the 1st Bone Spring Sand

Basin Geology

- Bounded by carbonate shelves & platforms
  - North: Northwest Shelf
  - East: Central Basin Platform
  - South: Marathon Fold Belt
  - West: Diablo Platform
- Bone Spring stratigraphy varies across the Delaware Basin
  - NW Shelf: predominantly carbonate
  - Slope: 1st/2nd/3rd sandstones developing in the lower part of the interval
- Deep Basin → Avalon Shale
  - "Shale" development within the upper 1st Carbonate section
  - Organic-rich siltstone and carbonate debris flow
  - Unconventional, continuous accumulation
  - 900 – 1,000' gross thickness



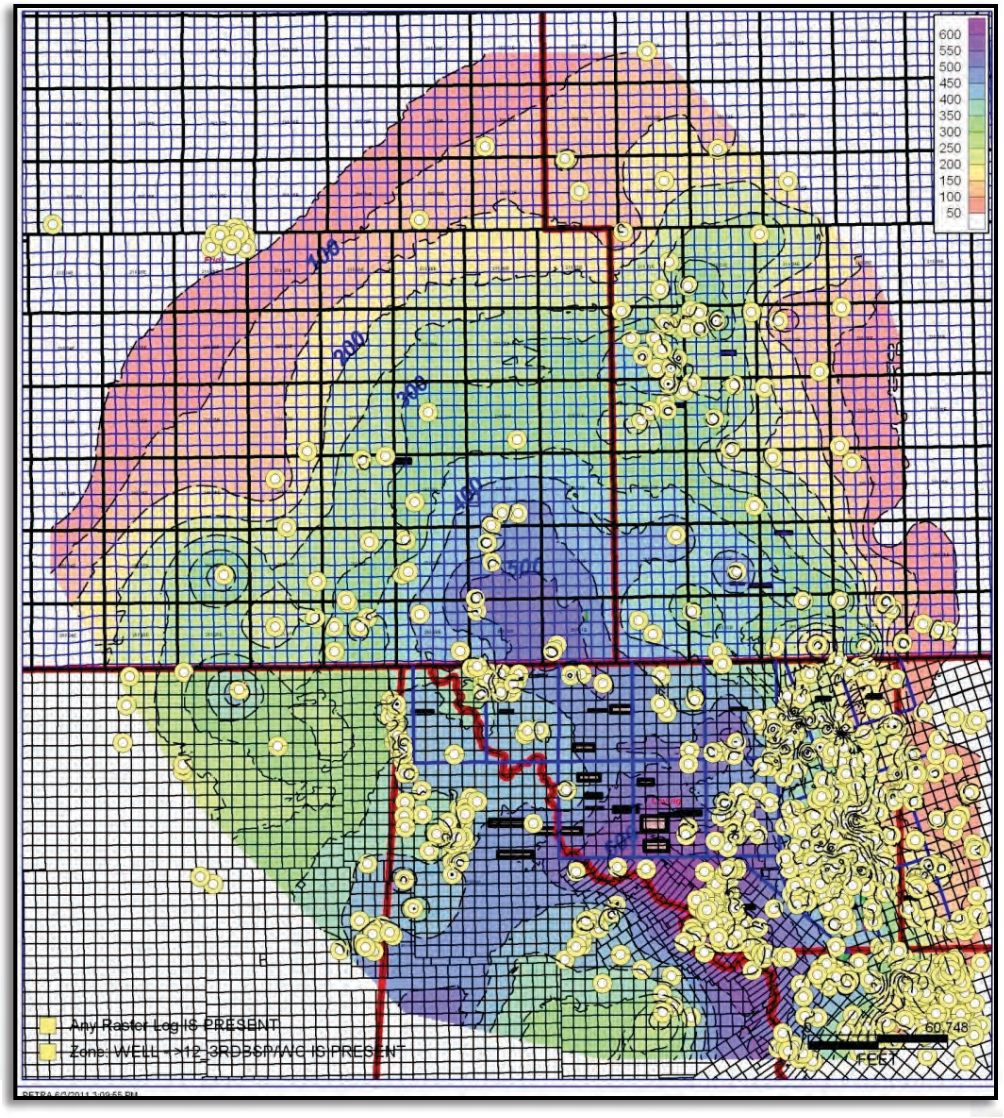
Avalon Shale Net Isopach

Summary

- Map Parameters
  - Ft > 12% Density Porosity
  - GR > 75 Units
  - Resistivity > 20 ohm-m
  - From 600 data points
- Isopach is concentric from basin edges
- Porosity thick coincides with Bone Spring thick above basin low
- Primarily Pelagic deposition

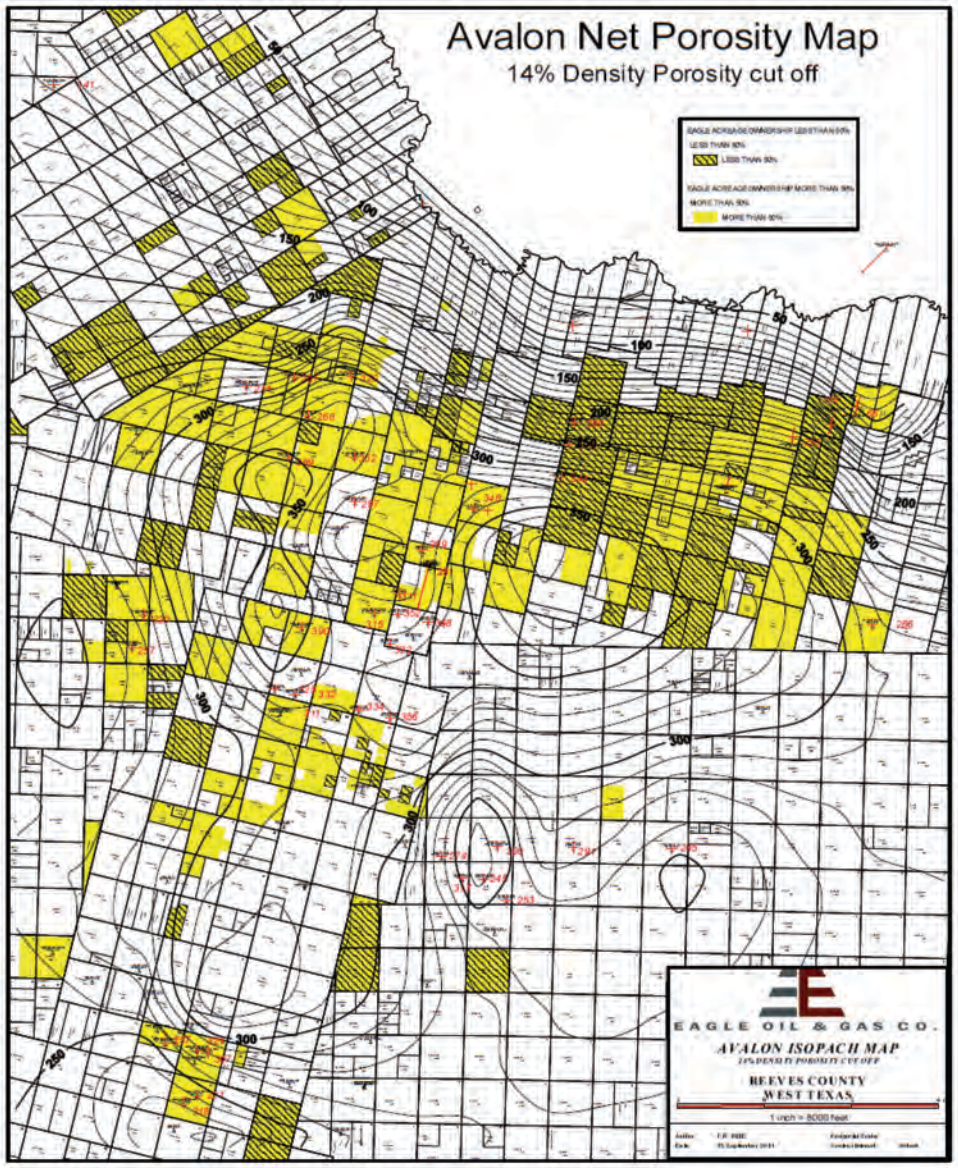
Structure

- Regional Structure dips east at 100' per mile
- 6,000' deep in W. Eddy to 10,000' deep in Lea County
- Lea County has more structural nosing and dip reversals than Eddy
- Axial low of basin trends N-S through Lea and Loving Counties
- GOR varies with depth with oily production in deeper basin



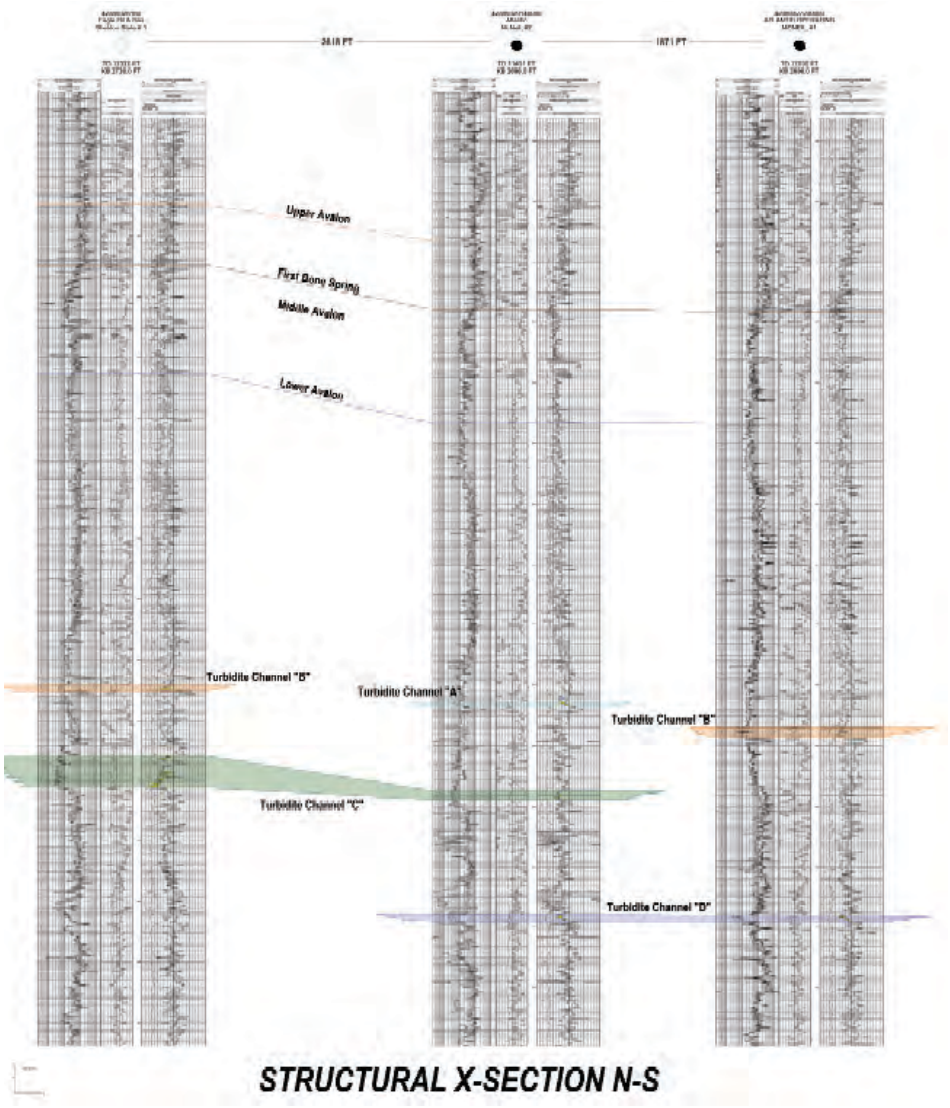
Source: Net isopach map and summary bullets from John Worrall (Geologist and Partner, Bold Energy II, LLC and Manzano Energy Partners), and Chad Kronkosky (Reservoir Engineer, Bold Energy II, LLC).

Eagle Avalon Shale Isopach

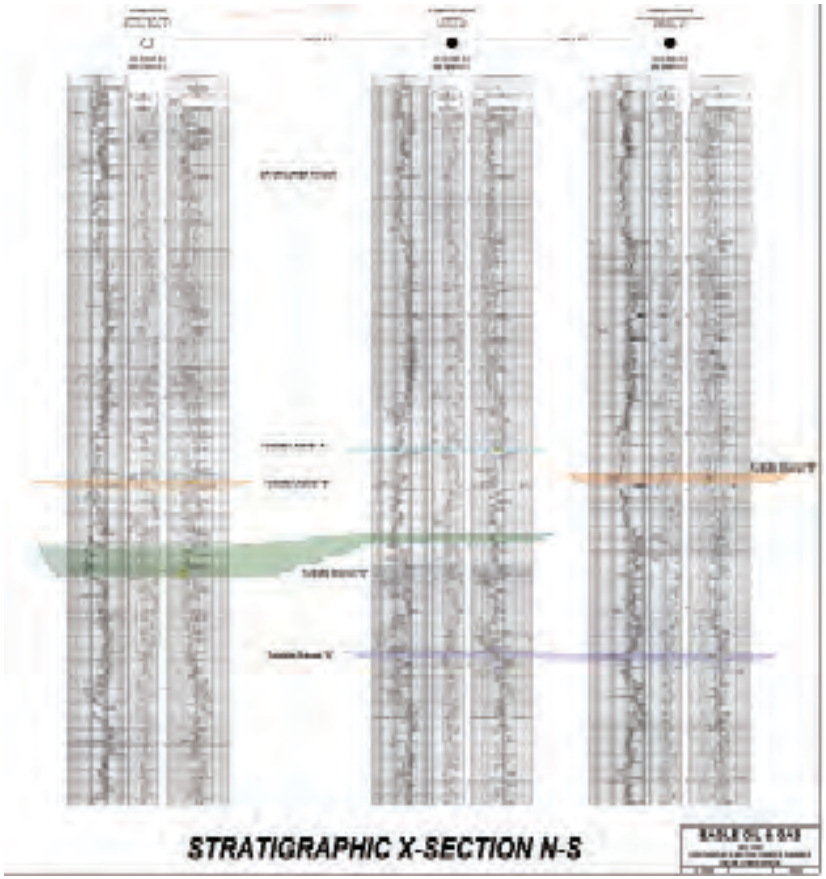


105 MMboe in-place per square mile across Eagle position

Turbidite Channel Cross-Section



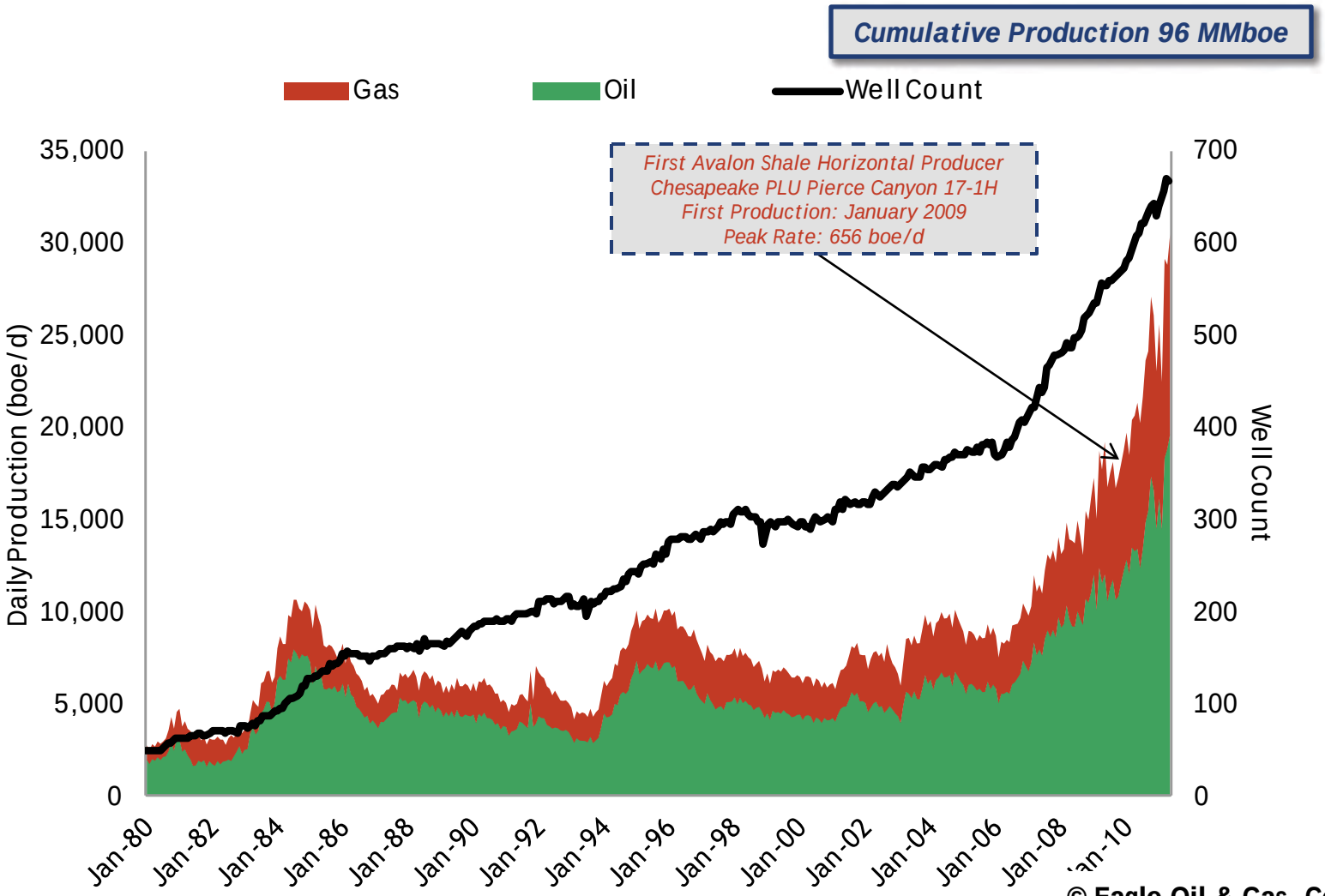
STRUCTURAL X-SECTION N-S



STRATIGRAPHIC X-SECTION N-S

Texas Avalon / Bone Spring Production Increasing

Production growth expected to continue recent momentum given industry focus on liquids and public statements from operators



Source: HPDI. Includes vertical and horizontal wells with a target reservoir of Bone Spring or Avalon (HPDI does not currently distinguish between the zones) in the following counties: Reeves, Loving, Ward, Pecos, Winkler

Eagle Oil & Gas, Co.

WolfBone Play
Southern Delaware
Permian Basin

EAGLE OIL & GAS CO.

Fairhurst, Bill and Hanson, Mary Lisbeth, 2012, Evolution and Development of the WolfBone Play, Southern Delaware Bain, West Texas: An Emerging Frontier, An Oil Rich Unconvential Resources.