

ATLANTIC RIM CBM PLAY: THE NEWEST SUCCESSFUL CBM PLAY IN THE ROCKIES

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ACKNOWLEDGEMENTS

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- ❑ Merit Energy
- ❑ Warren E & P
- ❑ Texas Bureau of Economic Geology (A. Scott, R. Tyler, et al)

RESERVOIR CHARACTERISTICS

- ❑ **Shallow, Eastern Margin of Washakie Basin**

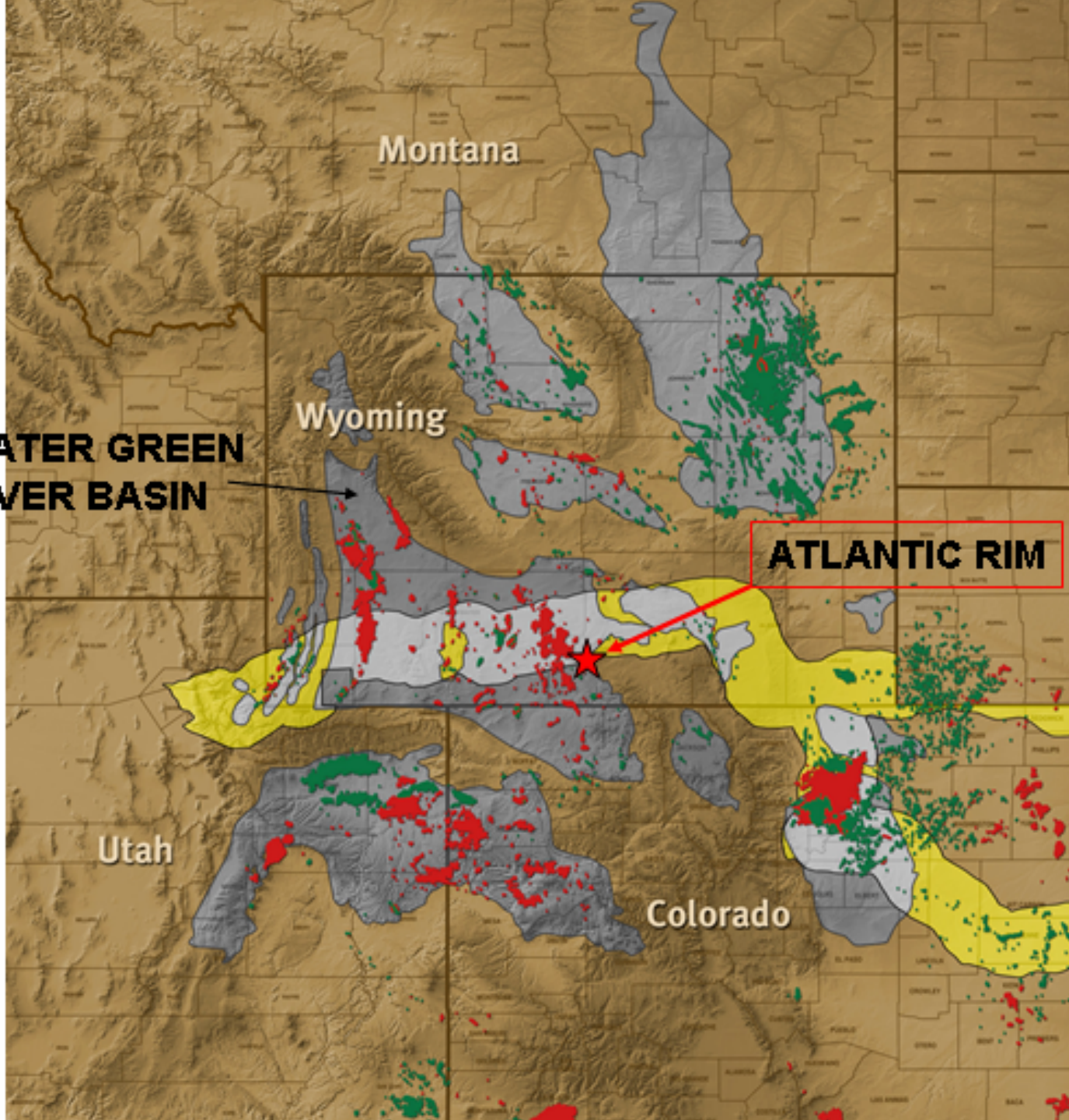
**GREATER GREEN
RIVER BASIN**

Wyoming

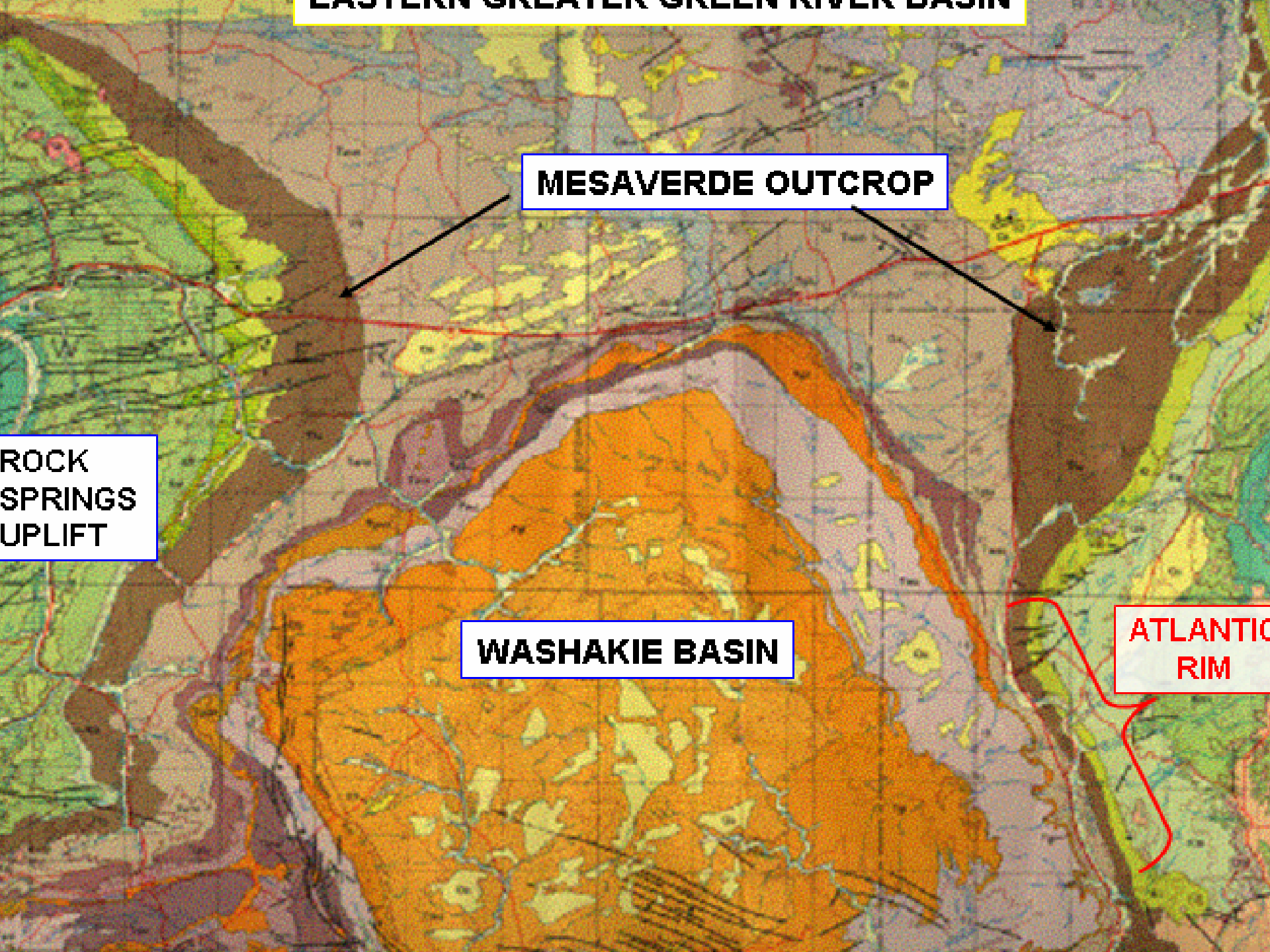
ATLANTIC RIM

Utah

Colorado



EASTERN GREATER GREEN RIVER BASIN



MESAVERDE OUTCROP

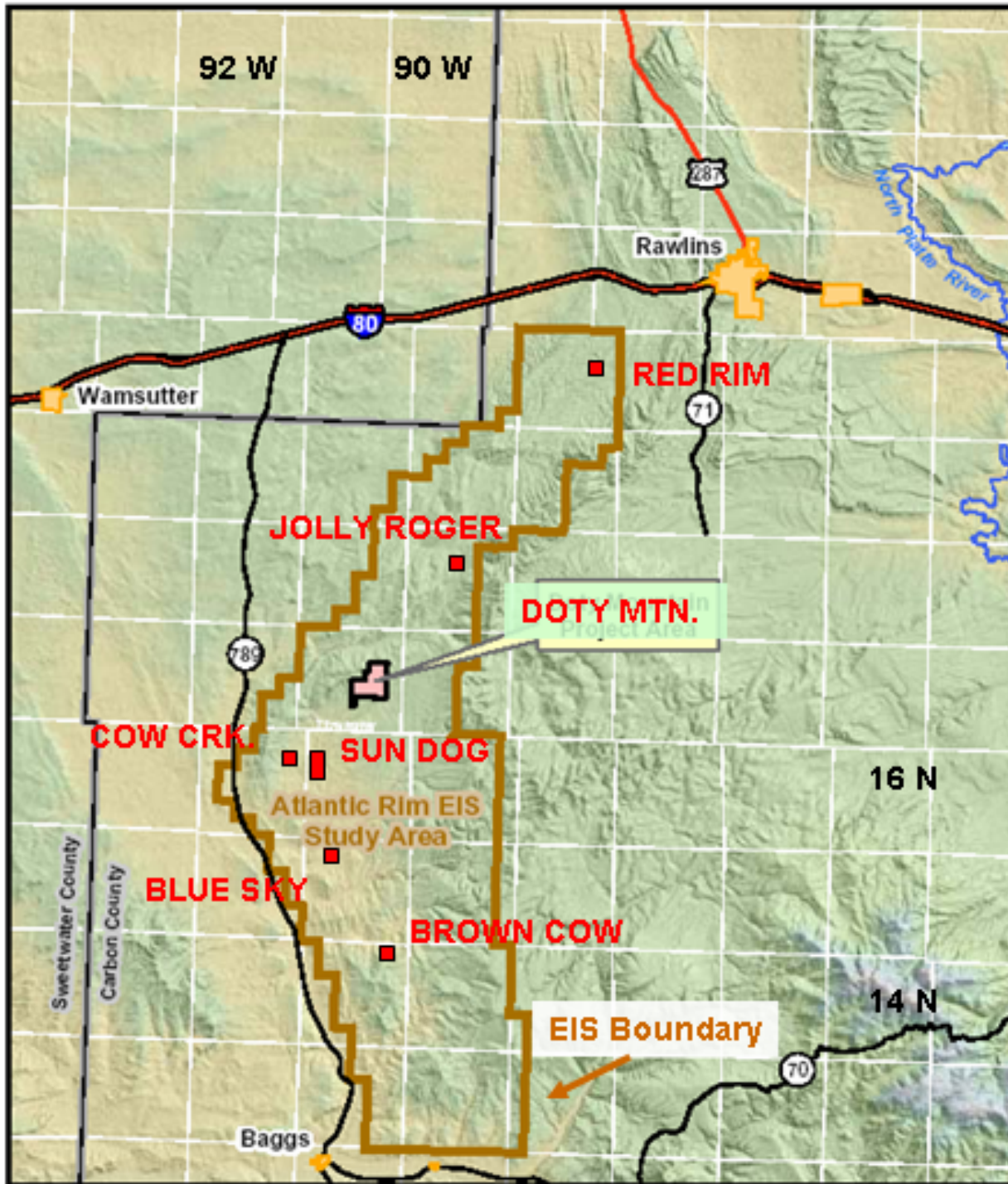
**ROCK
SPRINGS
UPLIFT**

WASHAKIE BASIN

**ATLANTIC
RIM**

ATLANTIC RIM CBM PLAY

EIS BOUNDARY AND EXPLORATORY PODS



RESERVOIR CHARACTERISTICS

- ❑ **Shallow, Eastern Margin of Washakie Basin**
- ❑ **Upper Cretaceous Coals in Almond and Allen Ridge Formations of Mesaverde Group**

LATE CRET. PRODUCING COAL BEDS AT ATLANTIC RIM

Mesaverde Group

FORMATION

**ENVIRONMENT/
LITHOLOGY**

Almond Fm.

Marine, terrestrial; ss, sandy-sh
coal, carbonaceous shale

Pine Ridge Sandstone
(= Williams Fork)

Marine, coastal plain estuary,
Beach; ss, conglomerate

Allen Ridge Fm.

(= Iles Fm.)

Terrestrial, coastal plain;
Ss, sh, mudstone, coal,
carbonaceous shale

Haystack Mtn. Fm.

Marine

RESERVOIR CHARACTERISTICS

- ❑ Shallow, Eastern Margin of Washakie Basin
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- ❑ **Current Productive Depths: 900 to 1400 Feet**

TYPICAL DEPTHS TO PRODUCING COALS AT BROWN COW UNIT

<i>Group / Formation / Seam</i>	<i>Depth</i>
Lewis Shale	Surface
Mesa Verde	645' – 1045'
Garden Gulch	649' – 1049'
A Series	904' – 1304'
Cow Creek	1043' – 1443'
Robertson	1106' – 1506'
Allen Ridge	1335' – 1735'
T.D.	1425' – 1825'

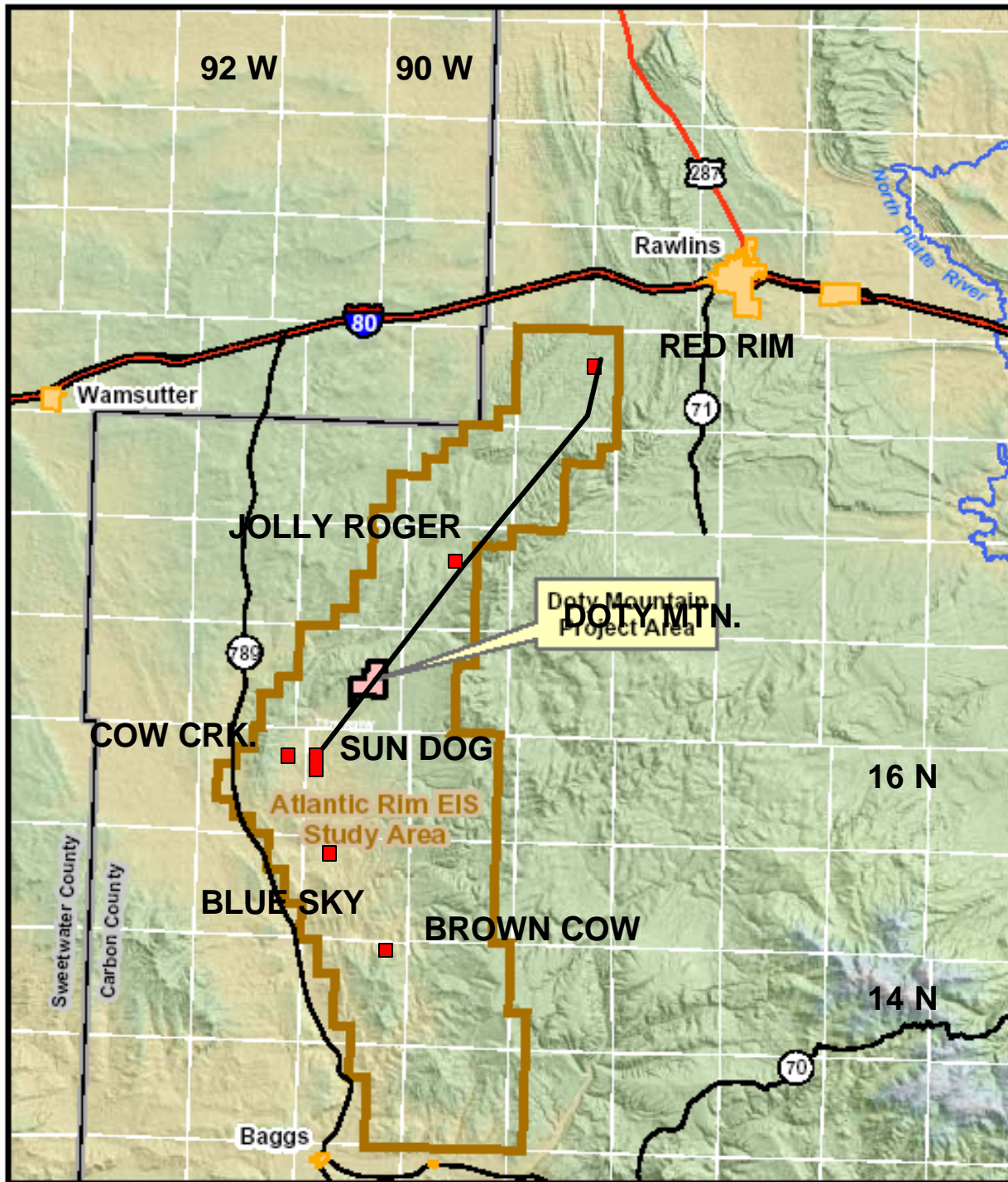
ALMOND COALS

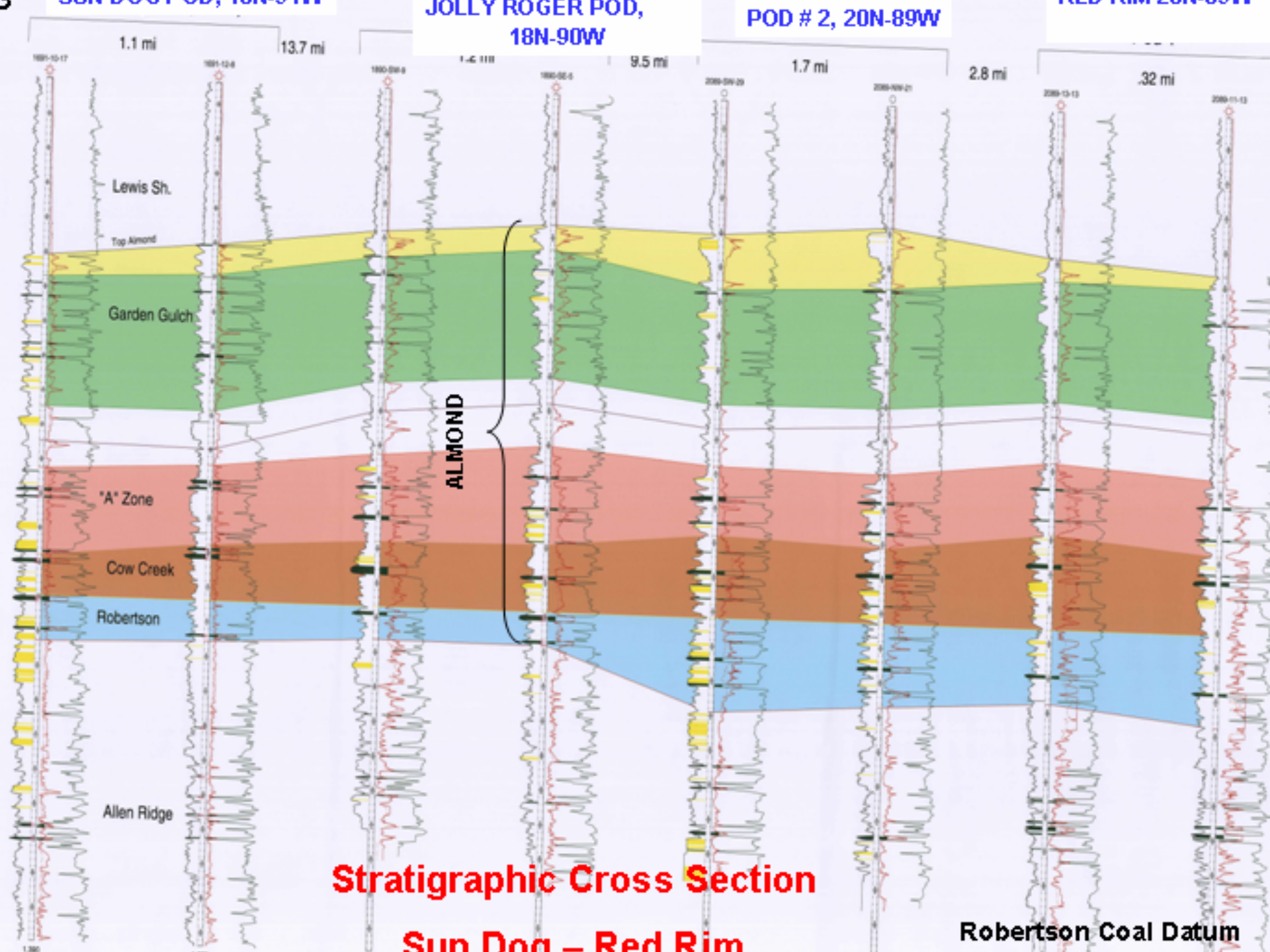
RESERVOIR CHARACTERISTICS

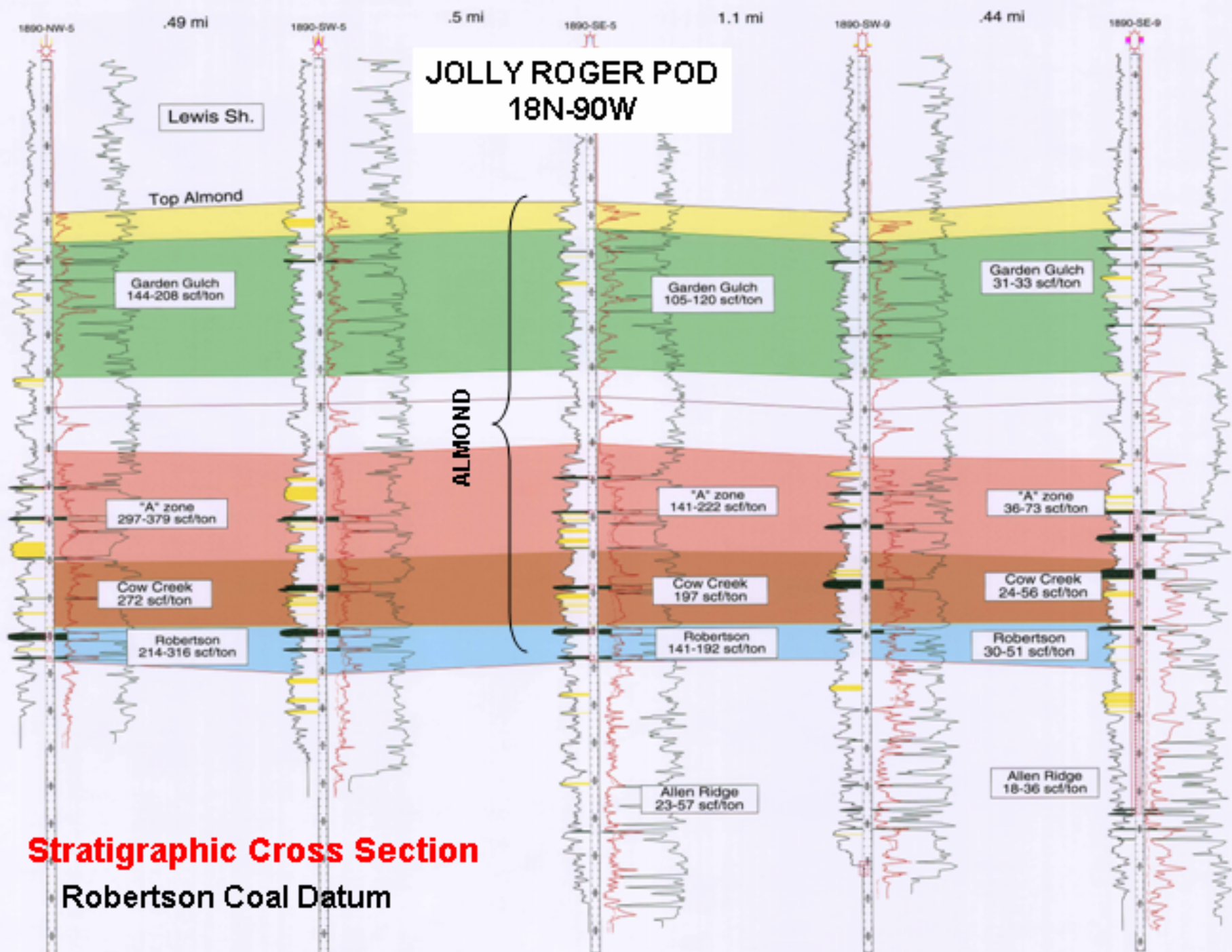
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- ❑ **Coal Depths: 500 to 4500 Feet**
- ❑ **Coal Rank:**
 - **Sub-Bituminous A to High Vol. C Bituminous**
 - **Ro 0.48% to 0.51%**
 - **Btu/lb (arb) 10,500 to 11,130**

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- ❑ **Ash Content: 2.8 to 17.5 % (at 2.0 g/cc cutoff)**

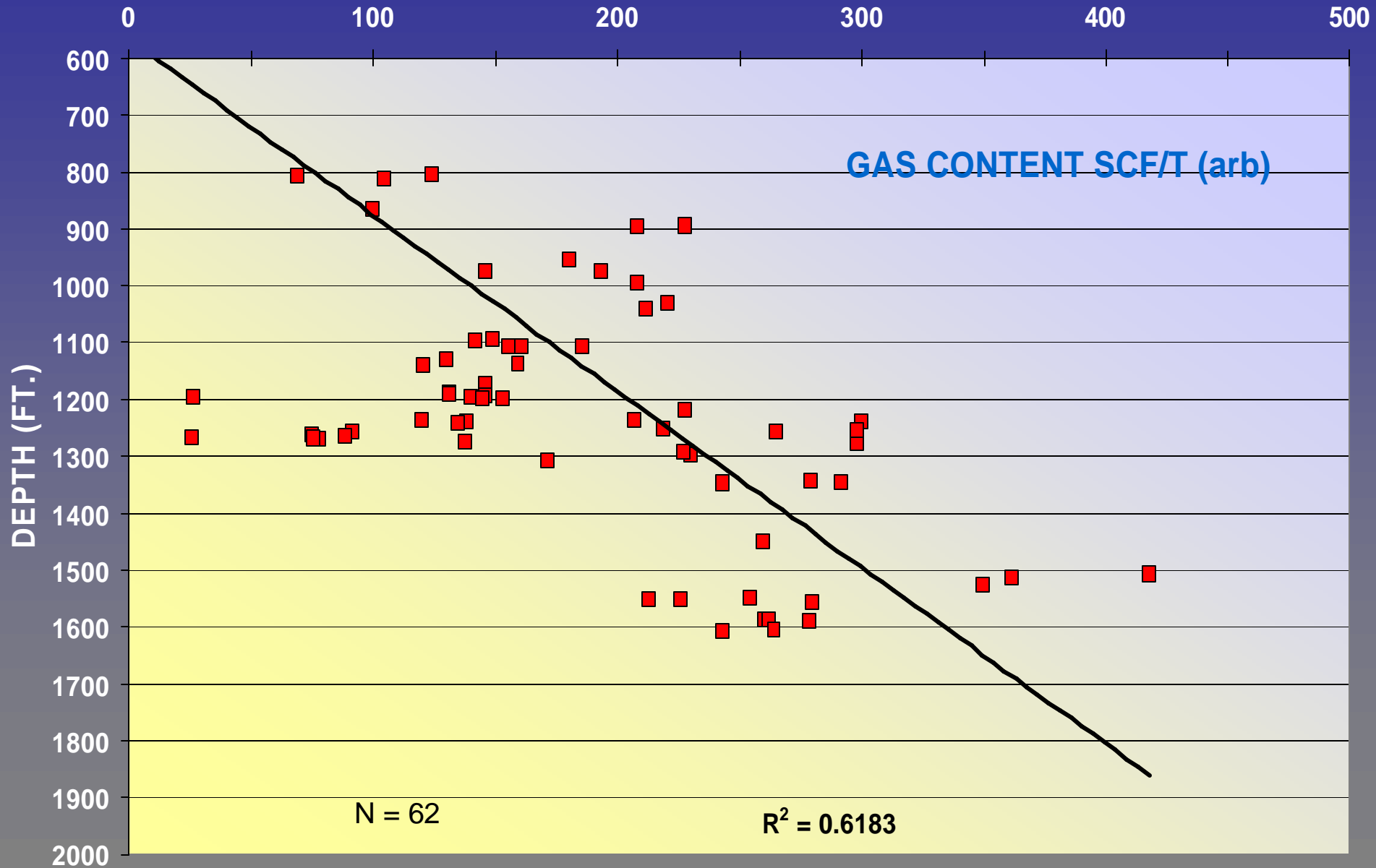
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- ❑ Moisture Content: 7.2 – 16.7 % (arb)

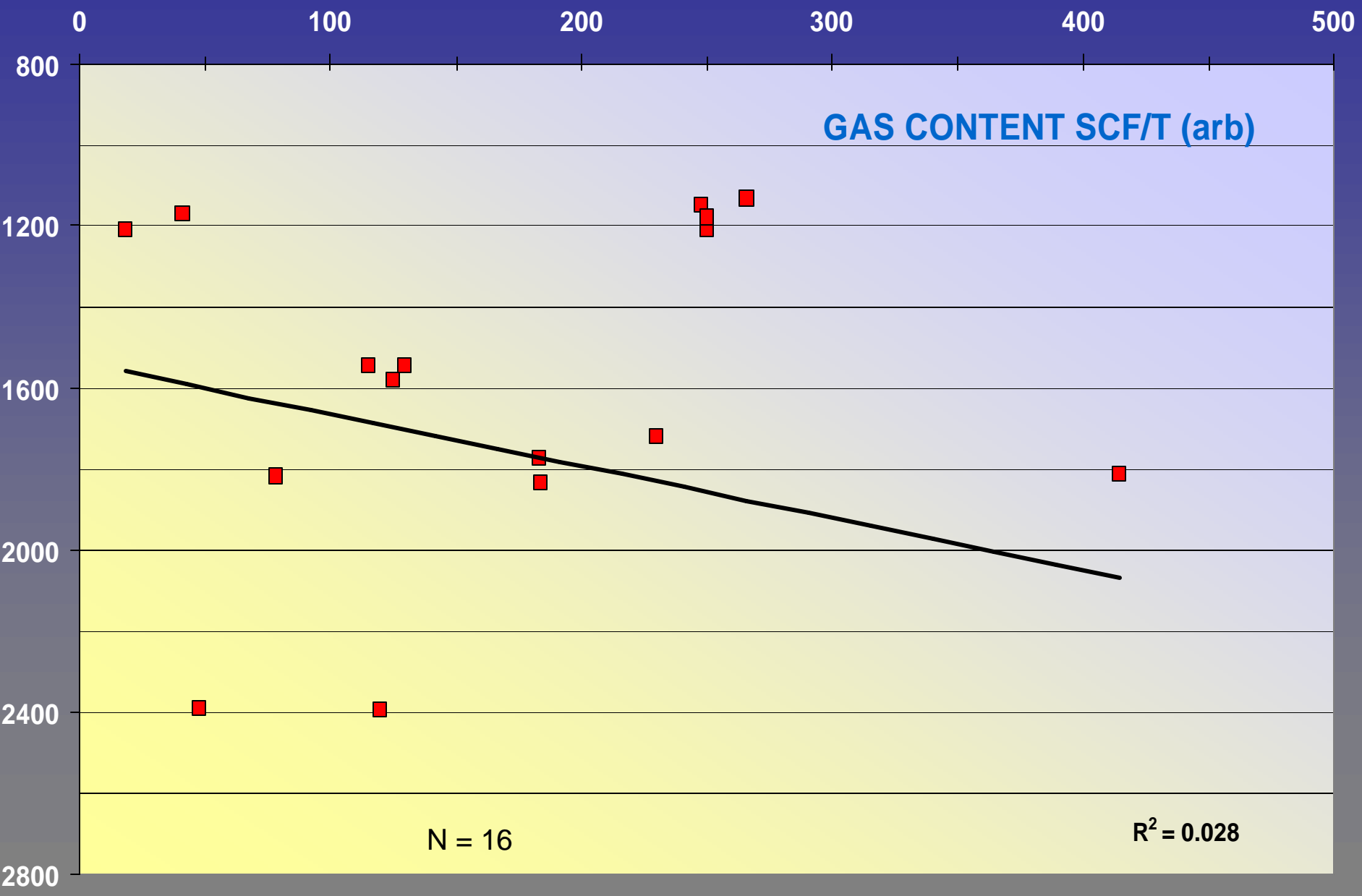
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- ❑ Moisture Content: 7.2 – 16.7 % (arb)
- ❑ Gas Content: 120 - 450 scf/t (arb)

ATLANTIC RIM ALMOND GAS CONTENT (ARB)

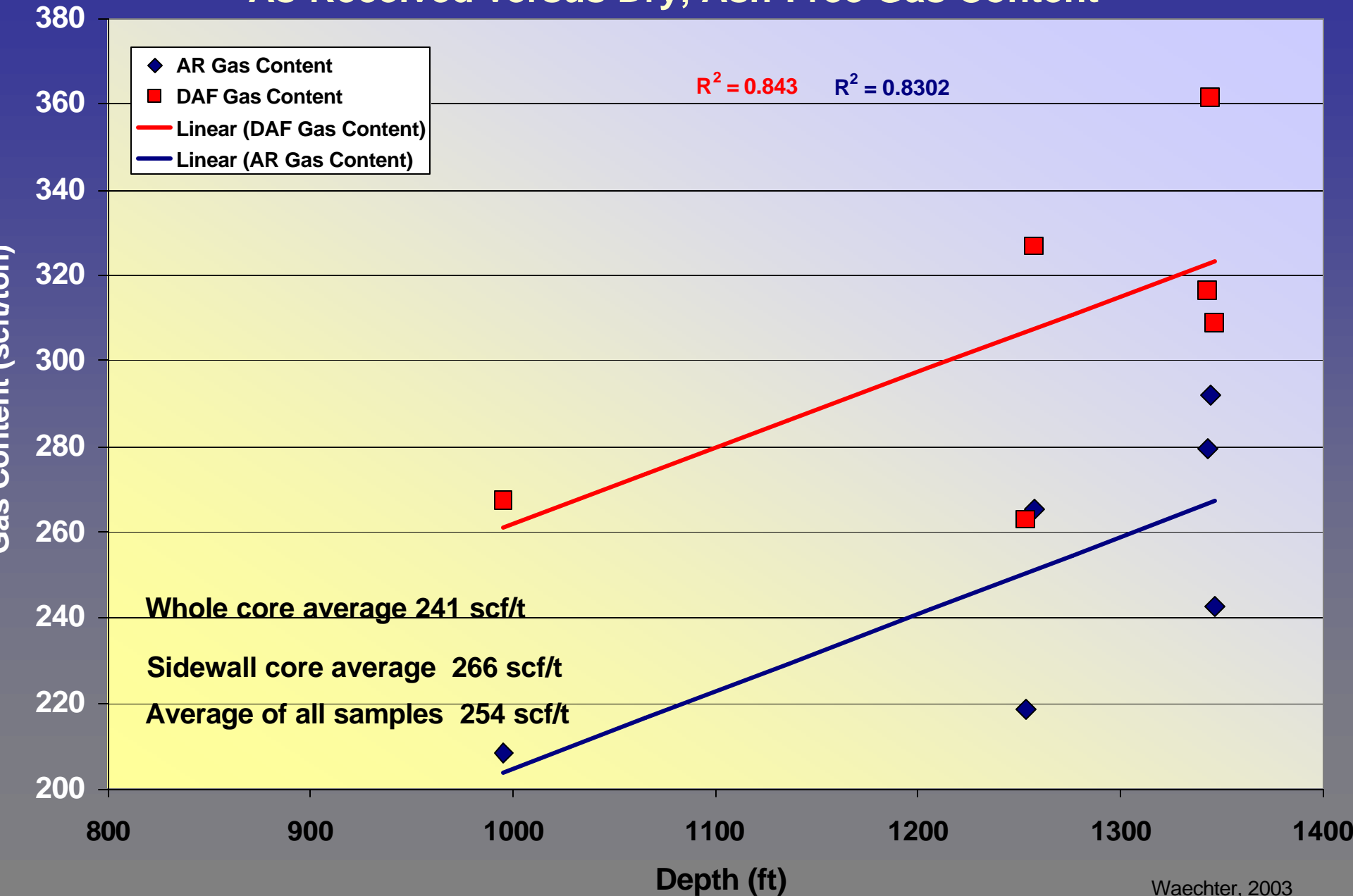


ATLANTIC RIM ALLEN RIDGE GAS CONTENT (ARB)



GAS CONTENT VERSUS DEPTH IN 43-12 WELL

As-Received versus Dry, Ash-Free Gas Content

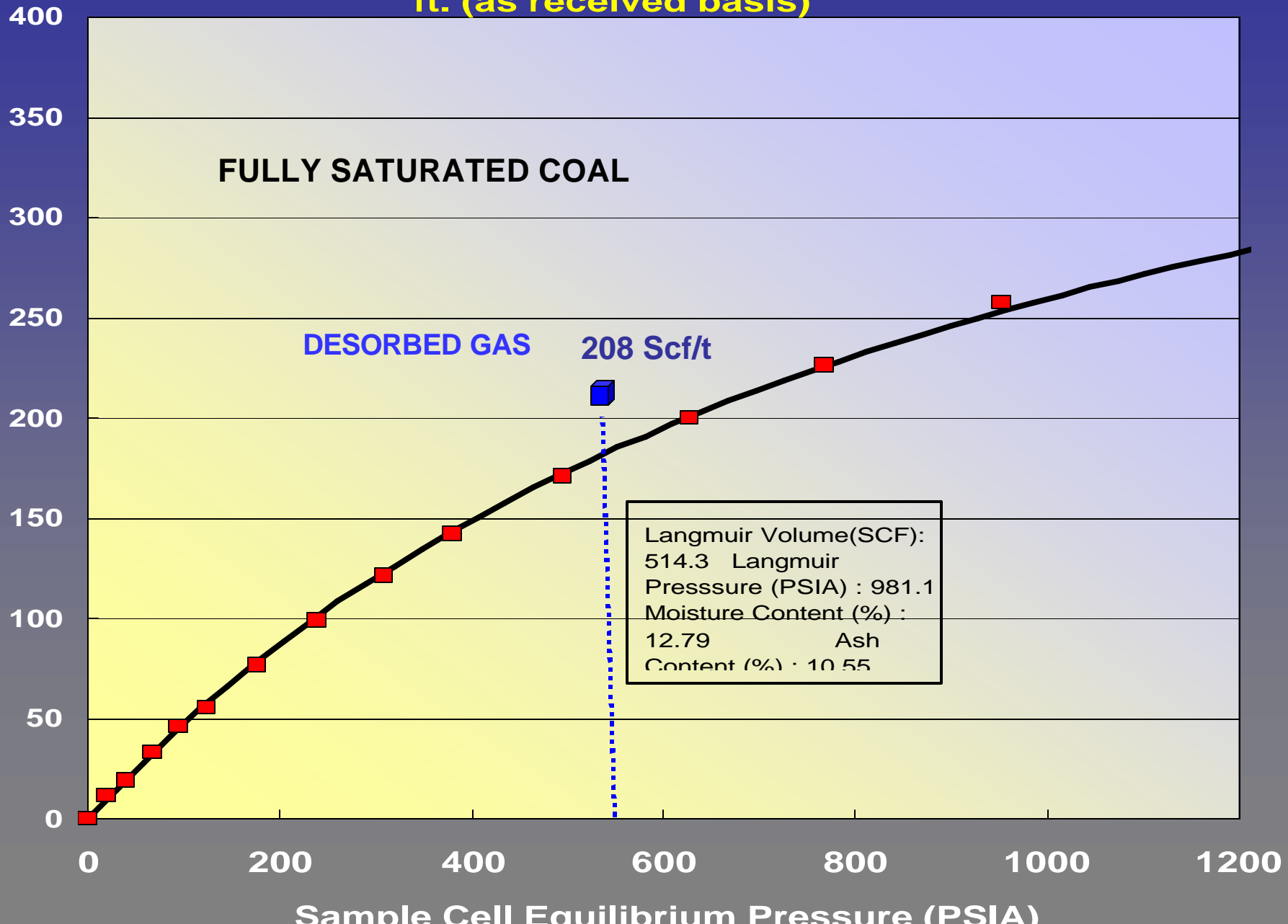


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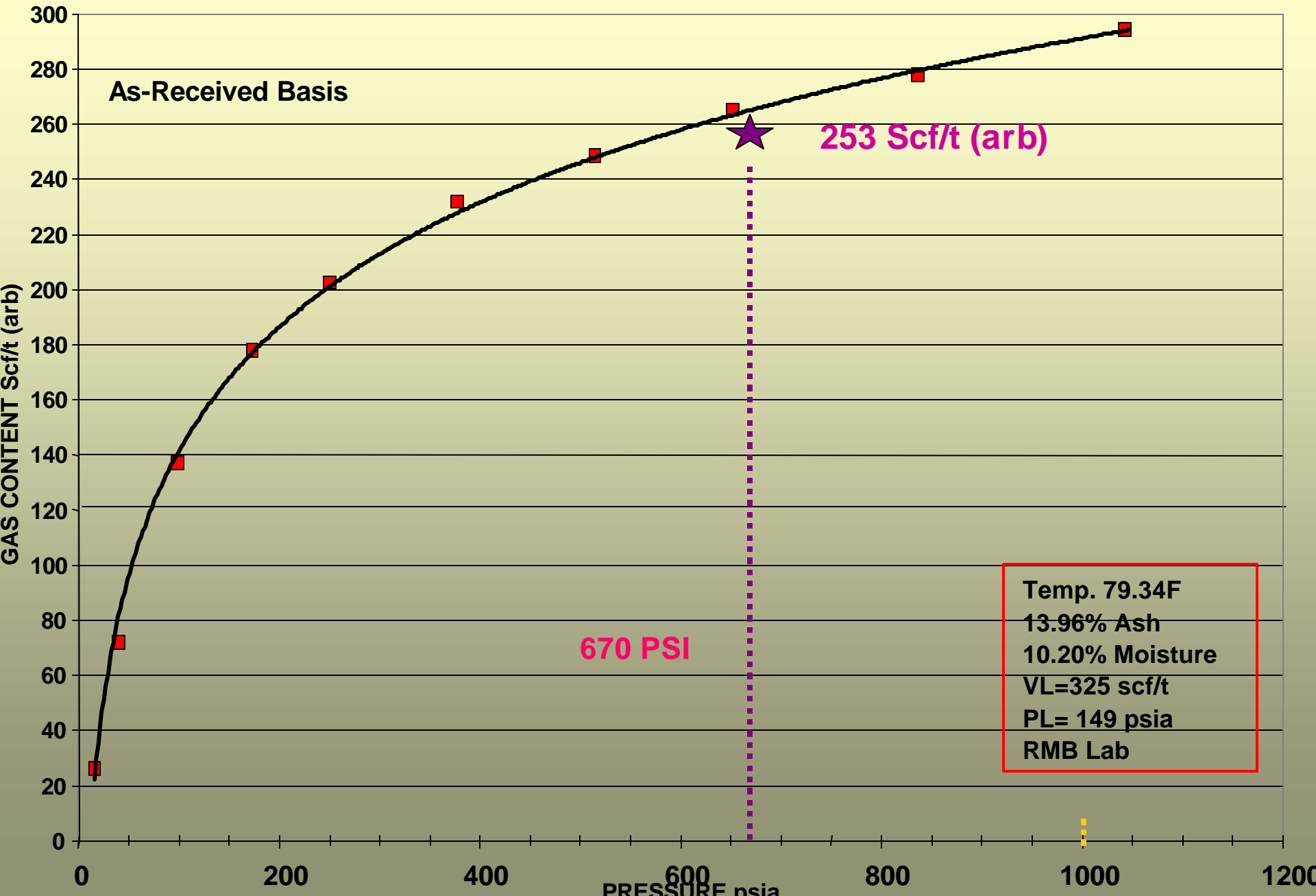
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- ❑ Moisture Content: 7.2 – 16.7 % (arb)
- ❑ Gas Content: 120 - 450 scf/t (arb)
- ❑ **Fully Saturated to Slightly Under-Saturated Coals**

**Cow Creek Unit #43-12 NESE Sec 12, T 16 N, R 92 W,
Carbon County, Wyoming: U. Almond: DECC-43-12-01: 995
ft. (as received basis)**

METHANE ADSORBED SCF/t (air dry)



FEDERAL 1691-16-8 WELL, SESE SEC. 8, T16N-R91W ADSORPTION ISOTHERM, 1133', 1149' AND 1208'- ALLEN RIDGE COALS



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- ❑ **Over-Pressured Coals: 0.50 to 0.67 psi/ft.**

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- ❑ Gas Content: 120 - 450 scf/t (arb)
- ❑ Fully Saturated to Slightly Under-Saturated Coals
- ❑ 20 – 50 Ft. Almond Coal at 2.0 g/cc Cutoff

ALMOND COALS ISOPACH

Red Rim

Contour Int. 10 Ft.

Jolly Roger

Doty Mtn. Pod

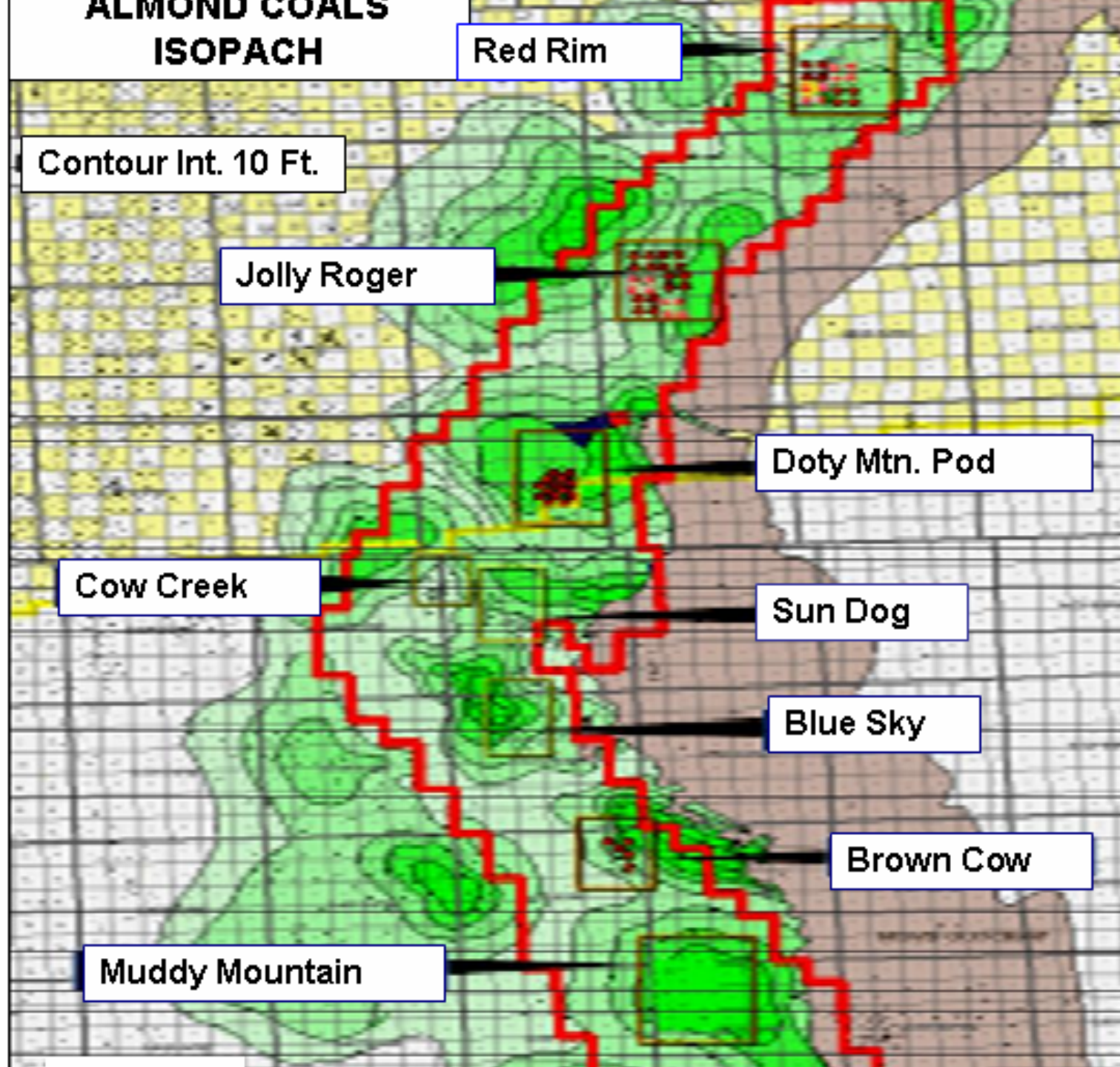
Cow Creek

Sun Dog

Blue Sky

Brown Cow

Muddy Mountain

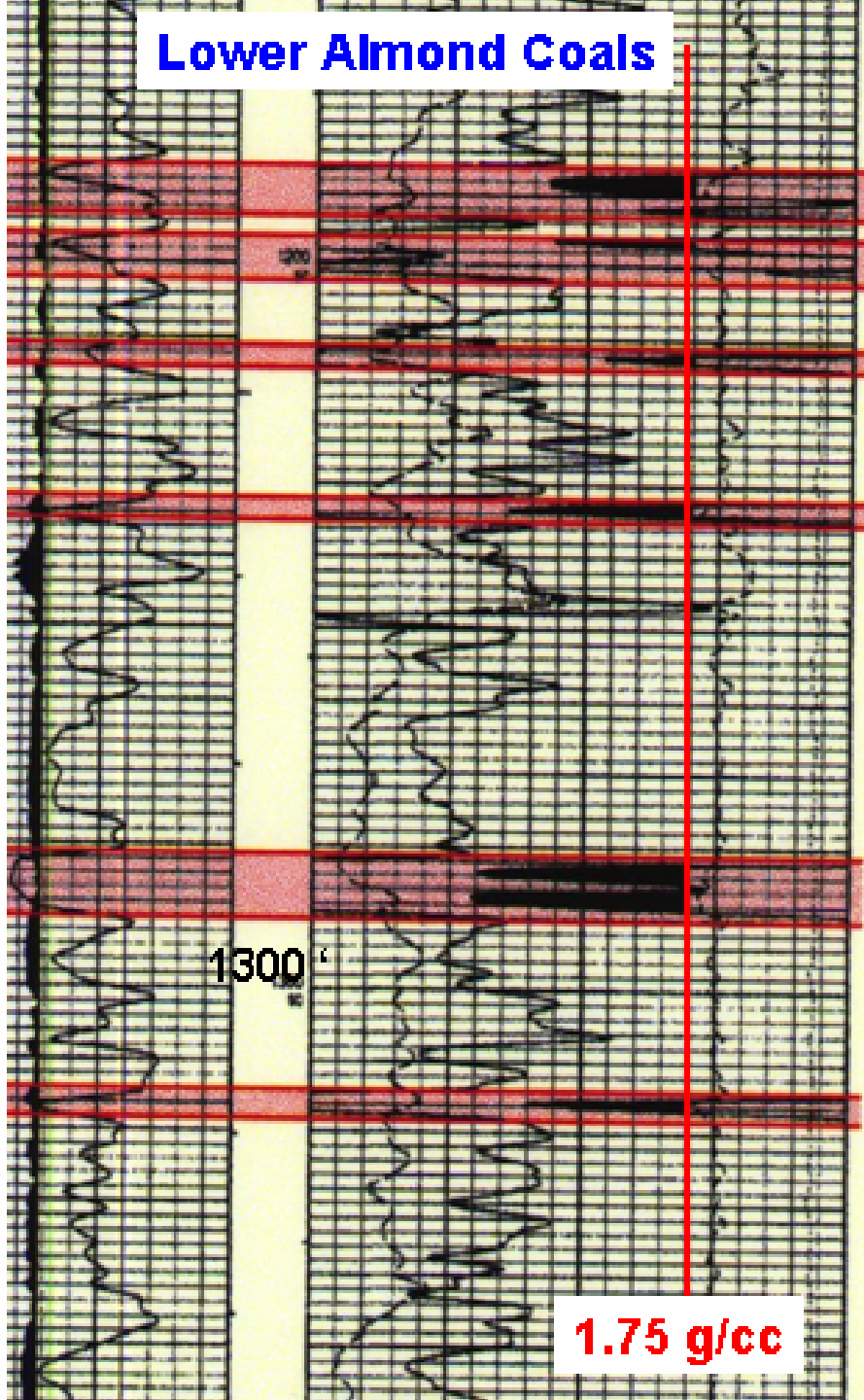


PRODUCTION AND OPERATORS

- ❑ Cow Creek – Double Eagle Production – 14 Wells
- ❑ Sun Dog Pod – Anadarko/Warren- 10 Wells
- ❑ Blue Sky Pod – Anadarko/Warren- 10 Wells
- ❑ Brown Cow Unit – Merit Energy – 5 Wells
- ❑ Doty Mountain Pod – Anadarko/ Warren/Double Eagle
– 20 Wells Drilling
- ❑ Red Rim – Anadarko/Warren- 8 Wells Drilling

❖ **Total 39 Producing Wells**

Lower Almond Coals



Cow Creek Unit # 32-12

SWNE Sec. 12, T16N-R92W

8 3/4" Hole

7" Casing

Perforate 1186' – 1290'

Frac. w/ 10,000 gals wtr.,

400,000 scf N₂

50,000 # 16/30 sand

Max. rate 30 BPM

IP 230 MCFD

323 BWPD

6/01/02

318 MCFD

802 BWPD

6/04

Cumulative

149 MMCF

382 BW

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323 BWPD

6/01/02

318 MCFD

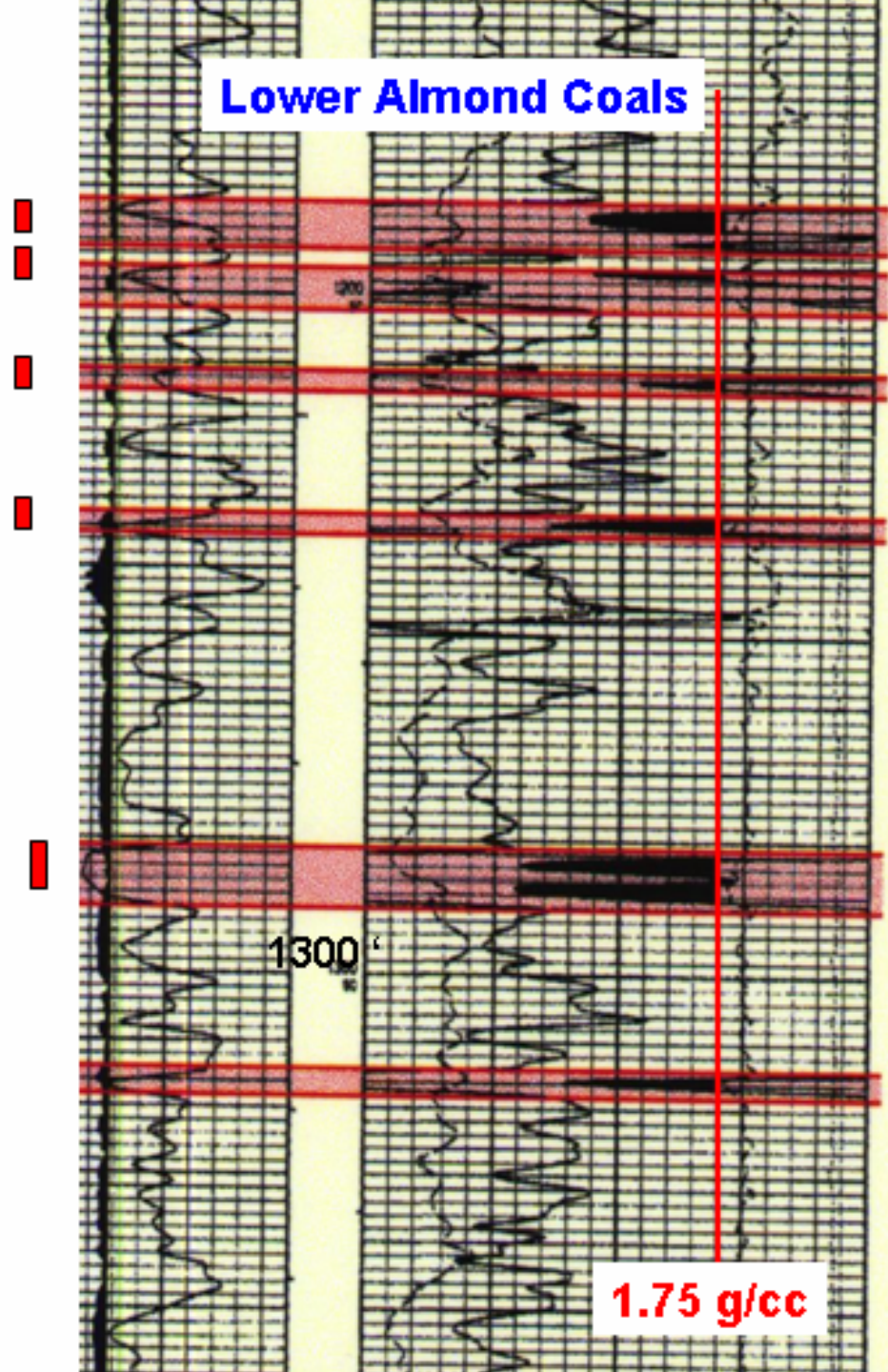
802 BWPD

6/04

Cumulative

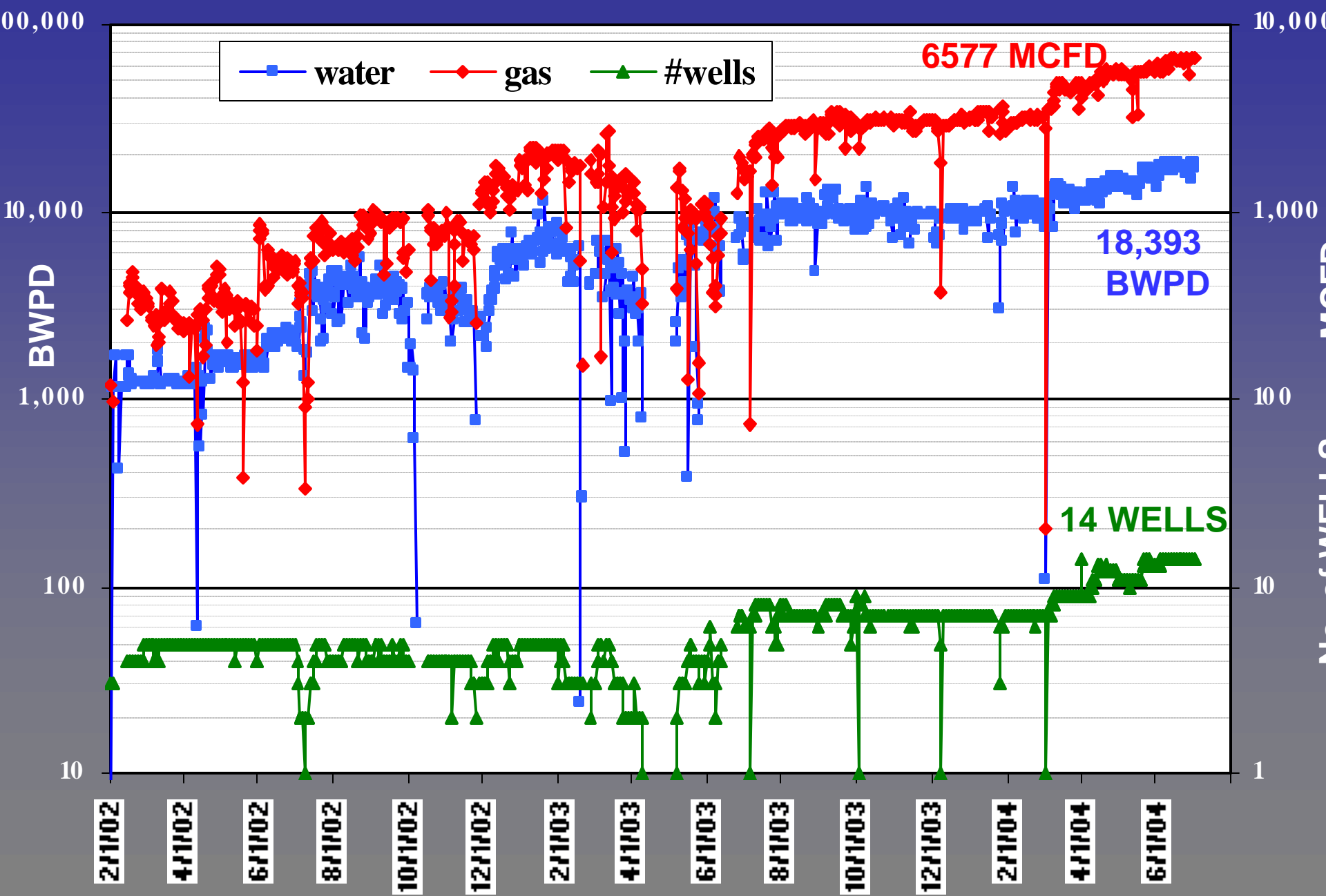
149 MMCF

382 BW

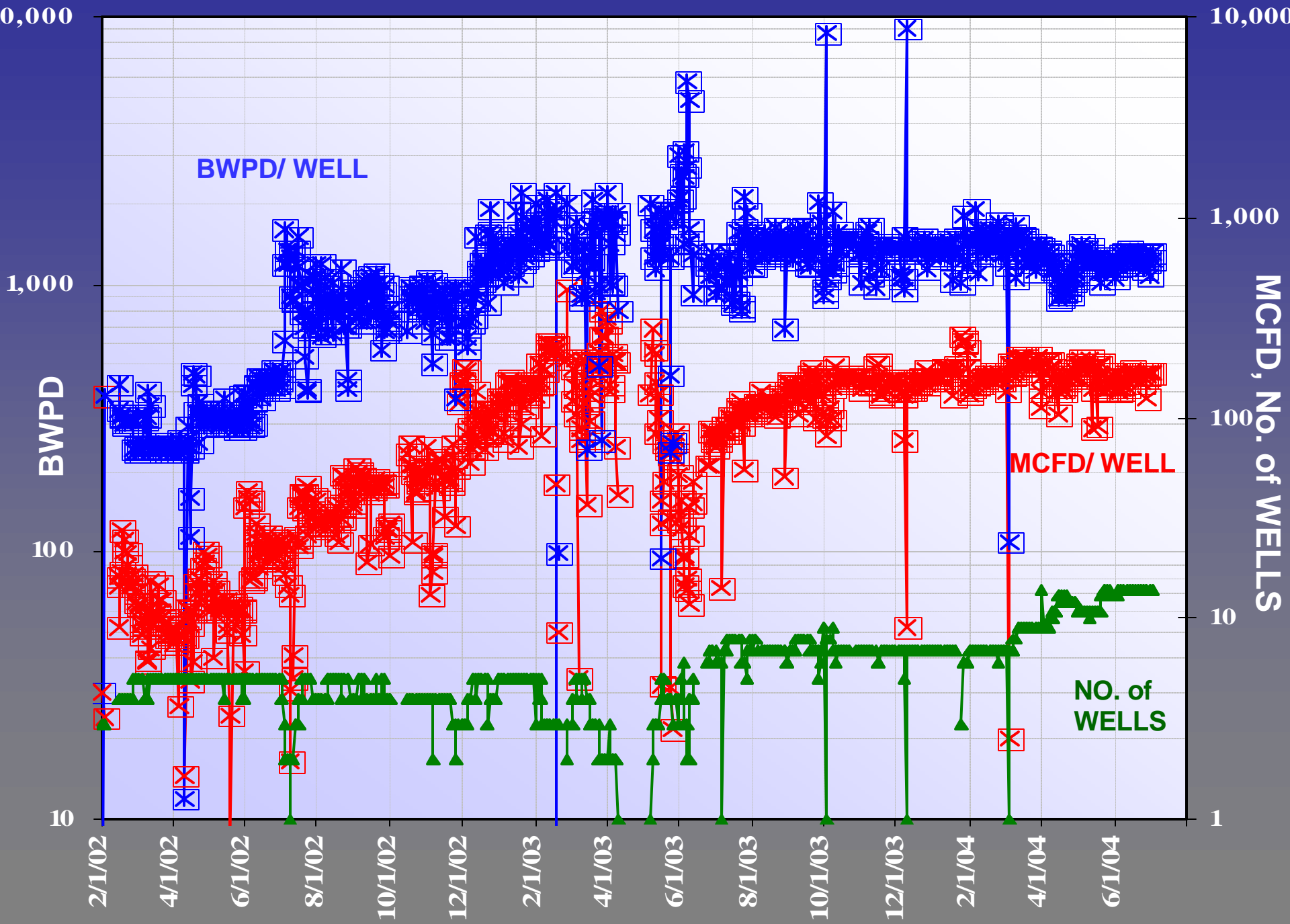


1.75 g/cc

TOTAL COW CREEK CBM PRODUCTION



COW CREEK AVERAGE PRODUCTION PER WELL



COW CREEK TOTAL WATER/GAS RATIO

100.00

78.0

10.00

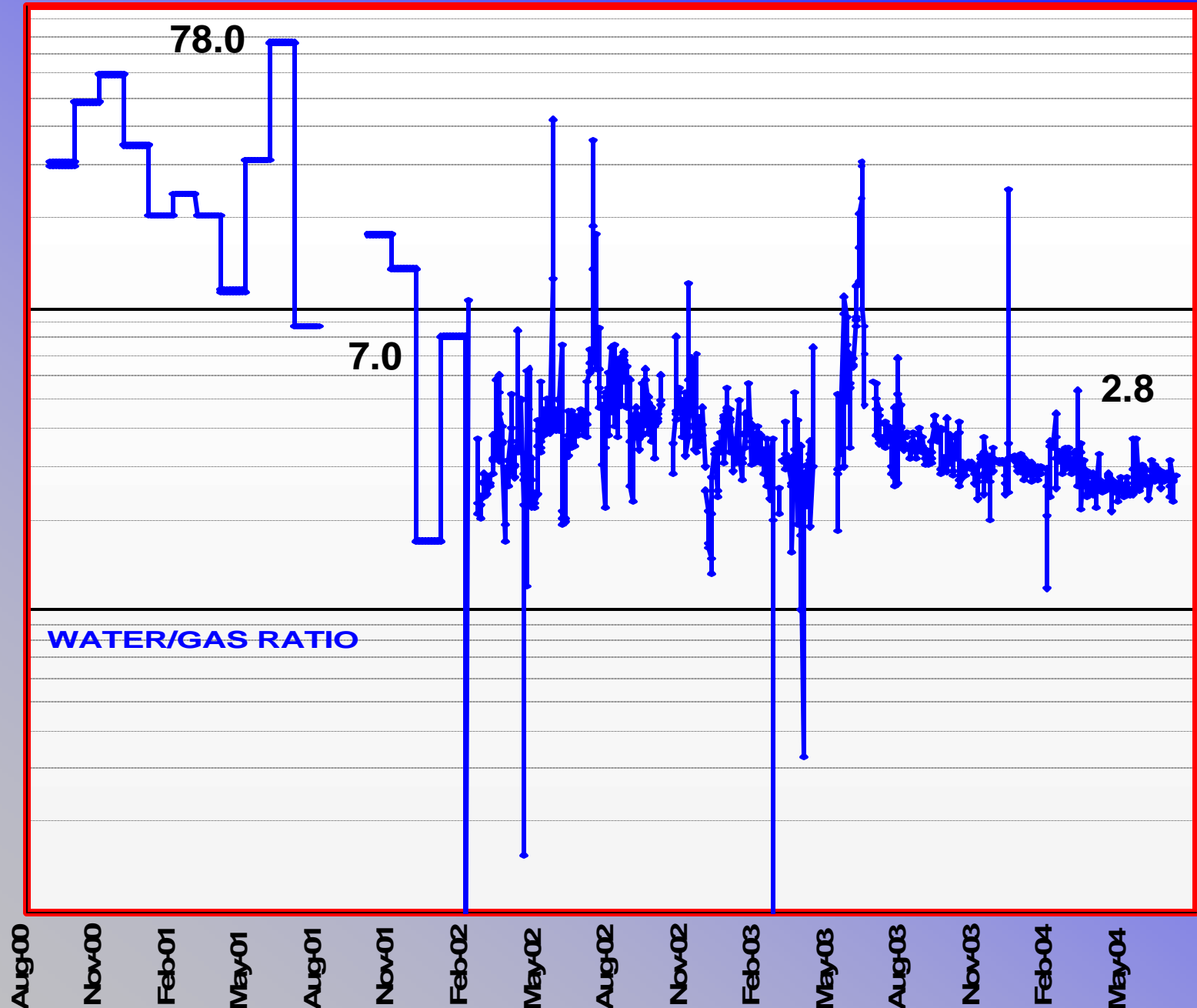
7.0

2.8

1.00

WATER/GAS RATIO

0.10



WELL # 42-12 PRODUCTION

10,000

10000

BWPD

MCFD

1,000

1000

100

100

10

10

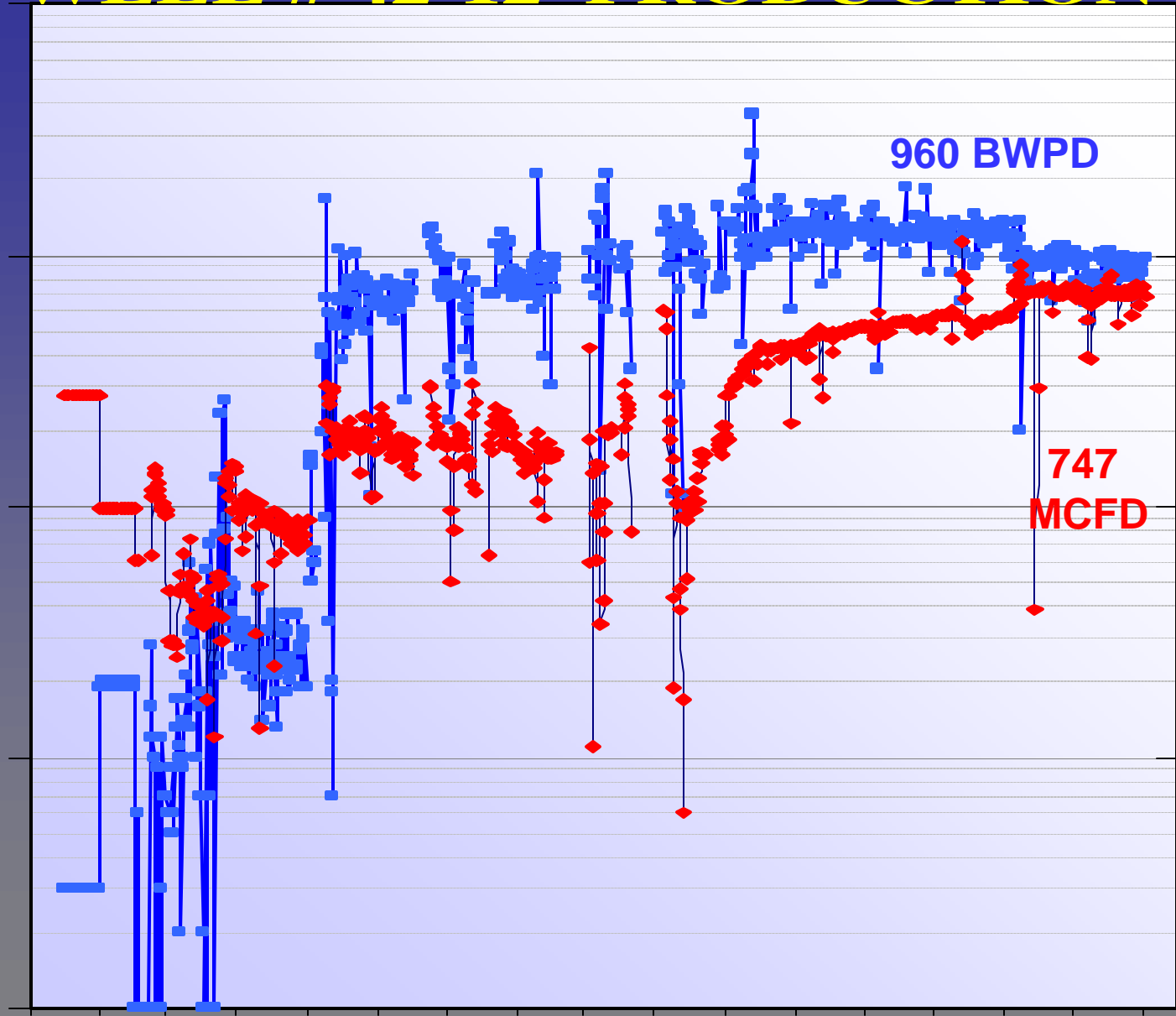
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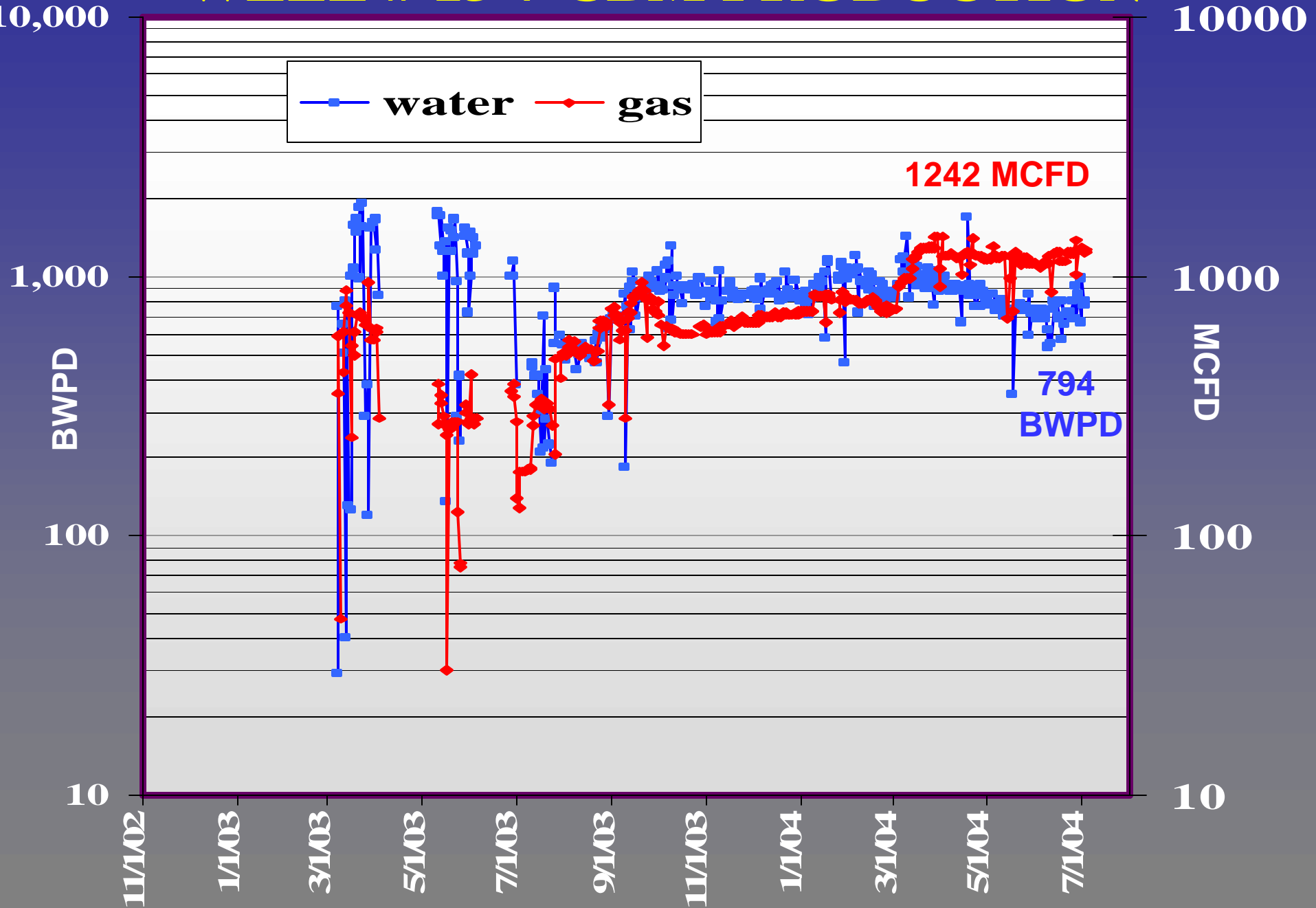
191101 71102 31102 51102 71102 91102 11102 71103 31103 51103 71103 91103 11103 71104 31104 51104 71104

960 BWPD

747 MCFD

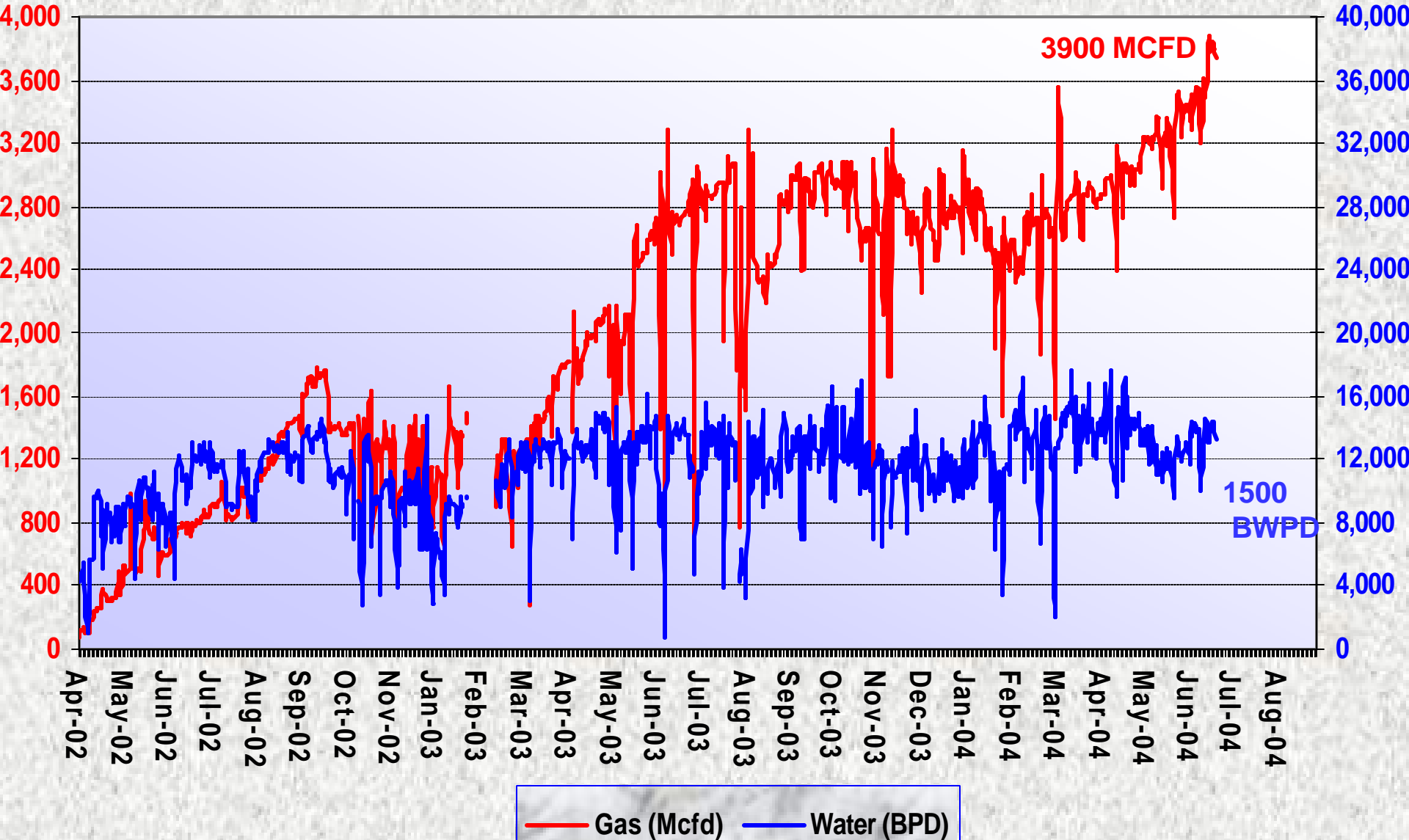


WELL # 13-7 CBM PRODUCTION

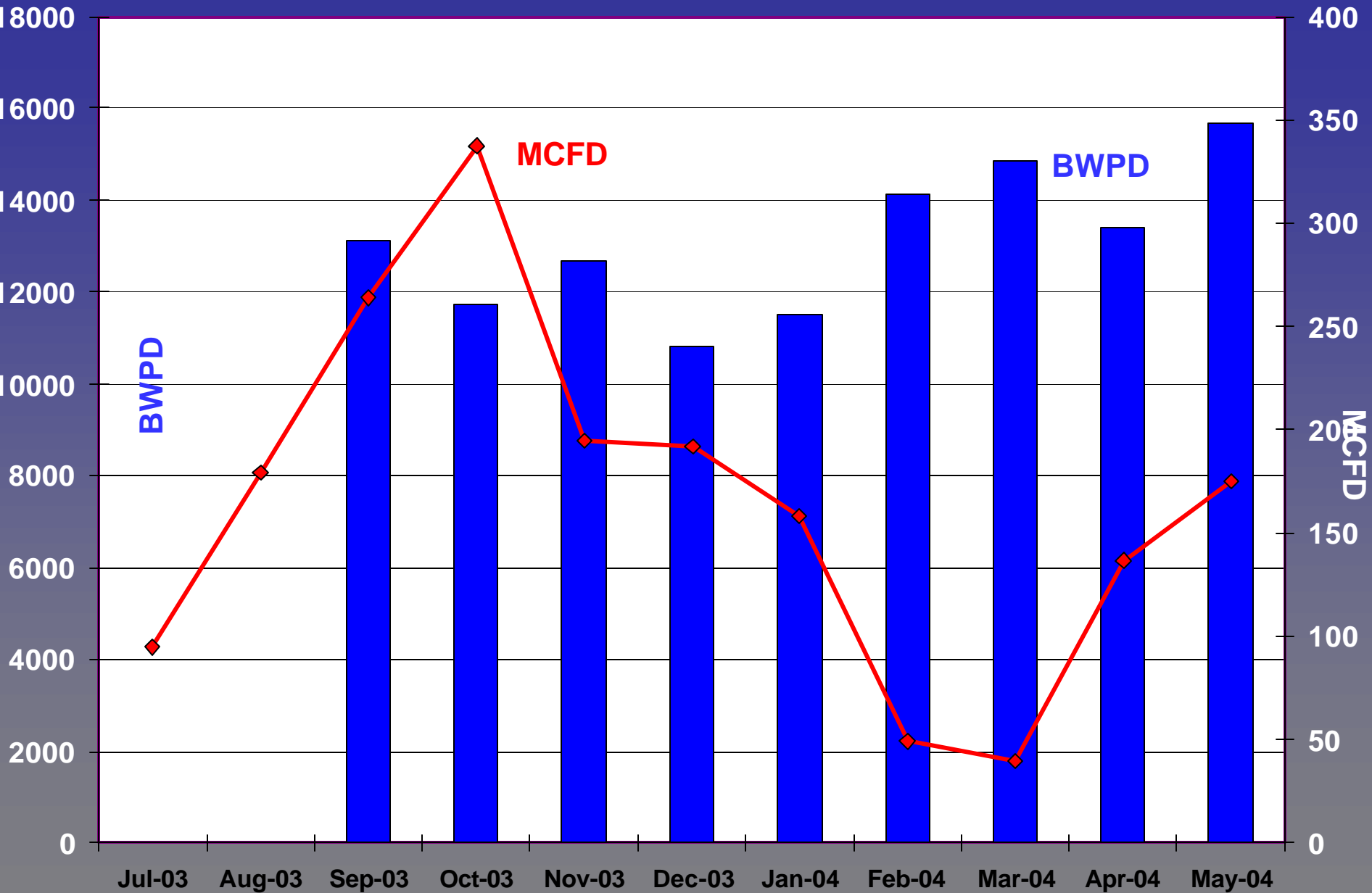


Atlantic Rim - Sun Dog Pilot (10 wells)

Carbon County, Wyoming



CBM PRODUCTION AT BLUE SKY POD



QUESTIONS TO BE ANSWERED

1. How much of the trend will be productive?
2. How pervasive is the good permeability?
3. At what depth will the permeability be too low?
4. How far to the east will the Allen Ridge coals be productive?
5. How many **TCF** will this play produce???