



“Super Fracs”

North Dakota Petroleum Council Annual Conference

September 23rd 2015

C. Mark Pearson



Liberty Resources LLC – Denver, CO

- An independent, private-equity backed E&P company with industry leading expertise in developing tight-oil plays using advanced completion designs and fracs.
- Three principals running our completions program have over 100 years combined industry experience and over 150 technical papers presented.
- Business plan for Liberty “Chapter 1” in 2010 was to prove up acreage in the Williston Central Basin and sell the asset in 3 years. Initially funded with \$200 Million equity commitment by Riverstone Holdings Fund IV.
- Liberty Resources II founded in November 2013 with \$365 Million of backing led by Riverstone Holdings Fund V. Operated positions in the Williston Basin (Tioga area) and Powder River Basin.

Early Hydraulic Fractured Horizontal Well



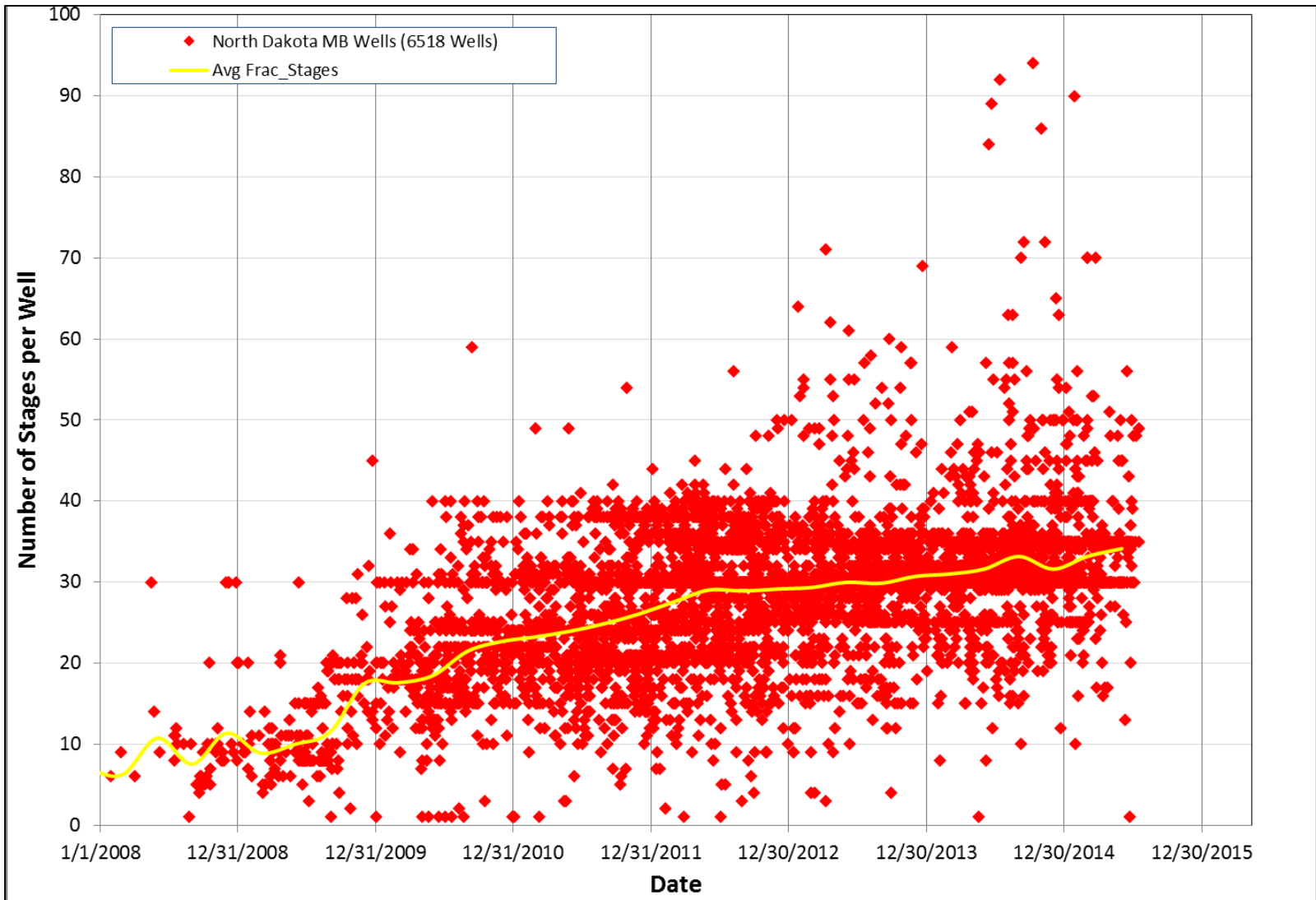
Courtesy of ARCO Oil & Gas \ Ahmed Abou-Sayed



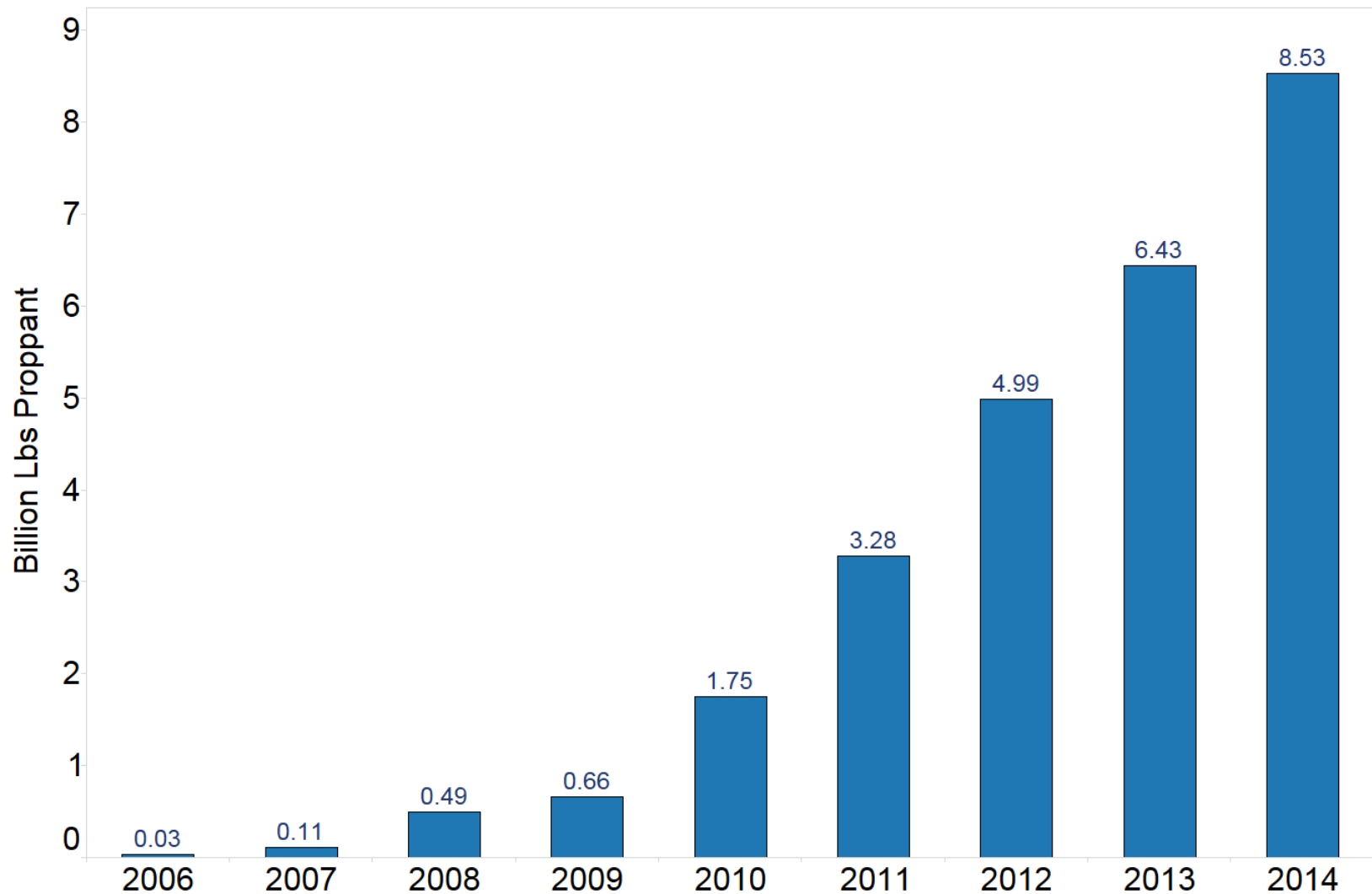
ARCO Oil & Gas operated well: W M Schrock (26) #8 – Frac'd July 7th 1987 3

Bakken Historical Completions

Number of Frac Stages/Well

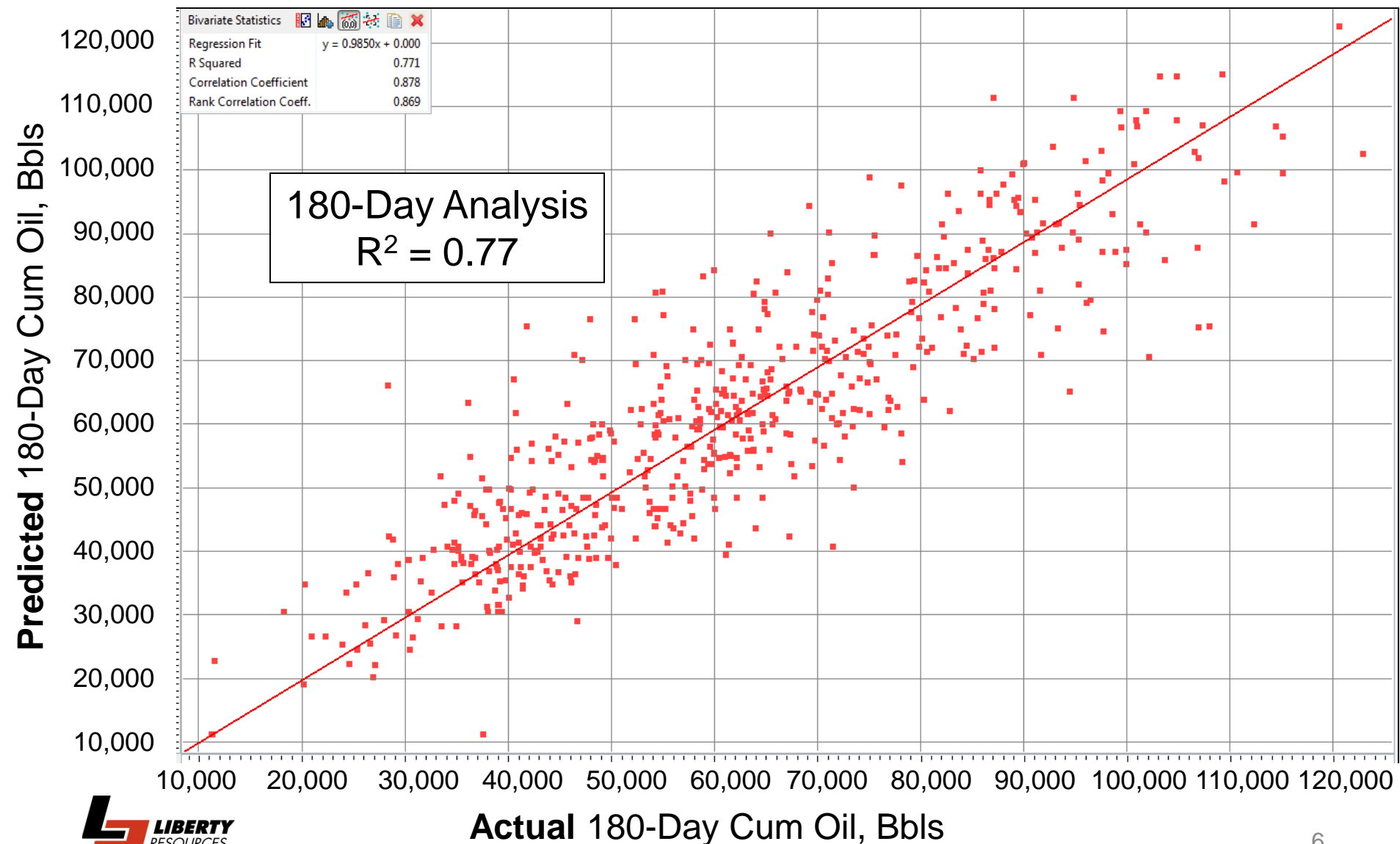


ND Proppant Usage (Billion Pounds/Year)



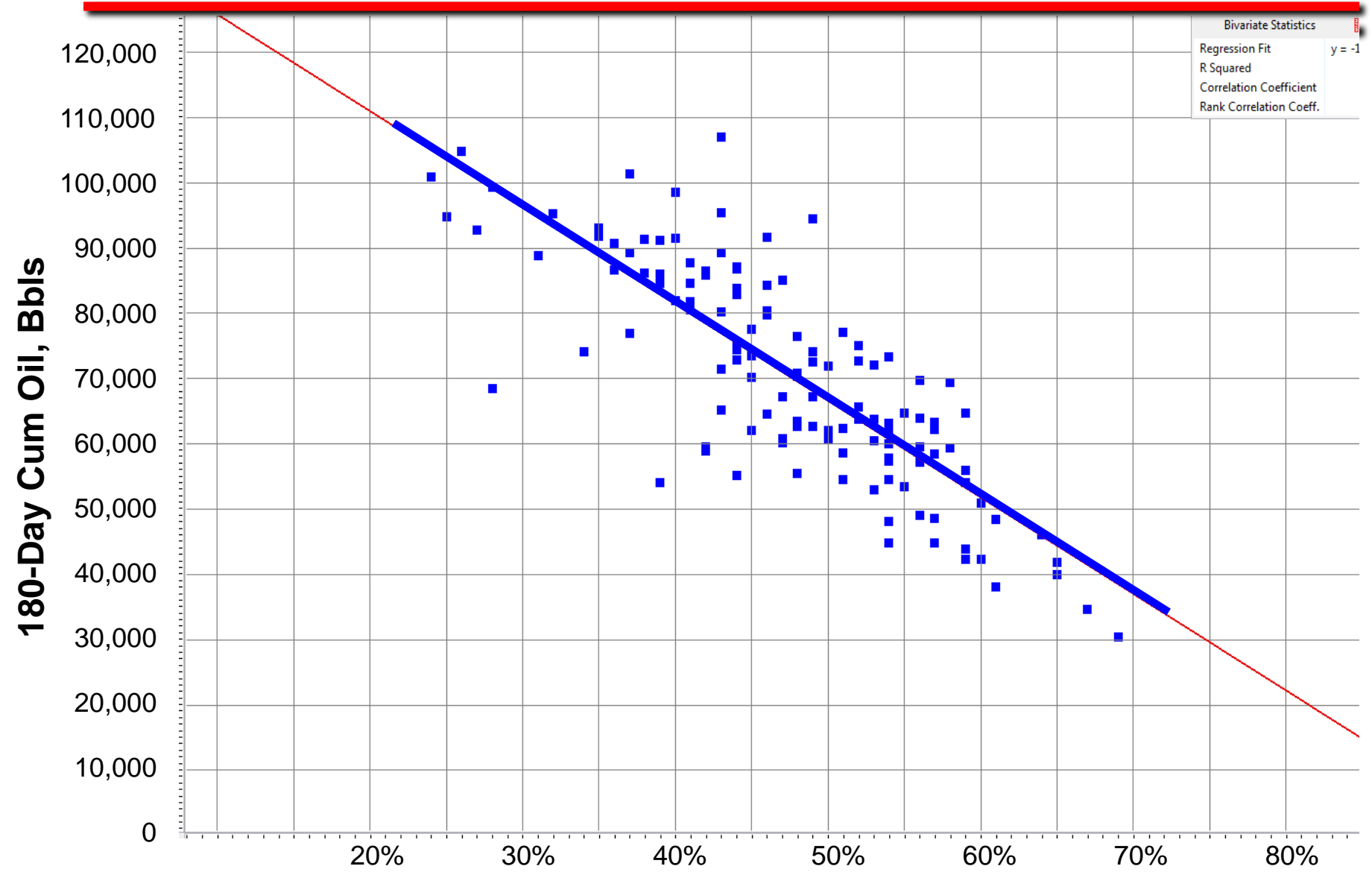
Central Basin Multivariate Model

Predicted vs. Actual 180-Day Cum Oil Analysis

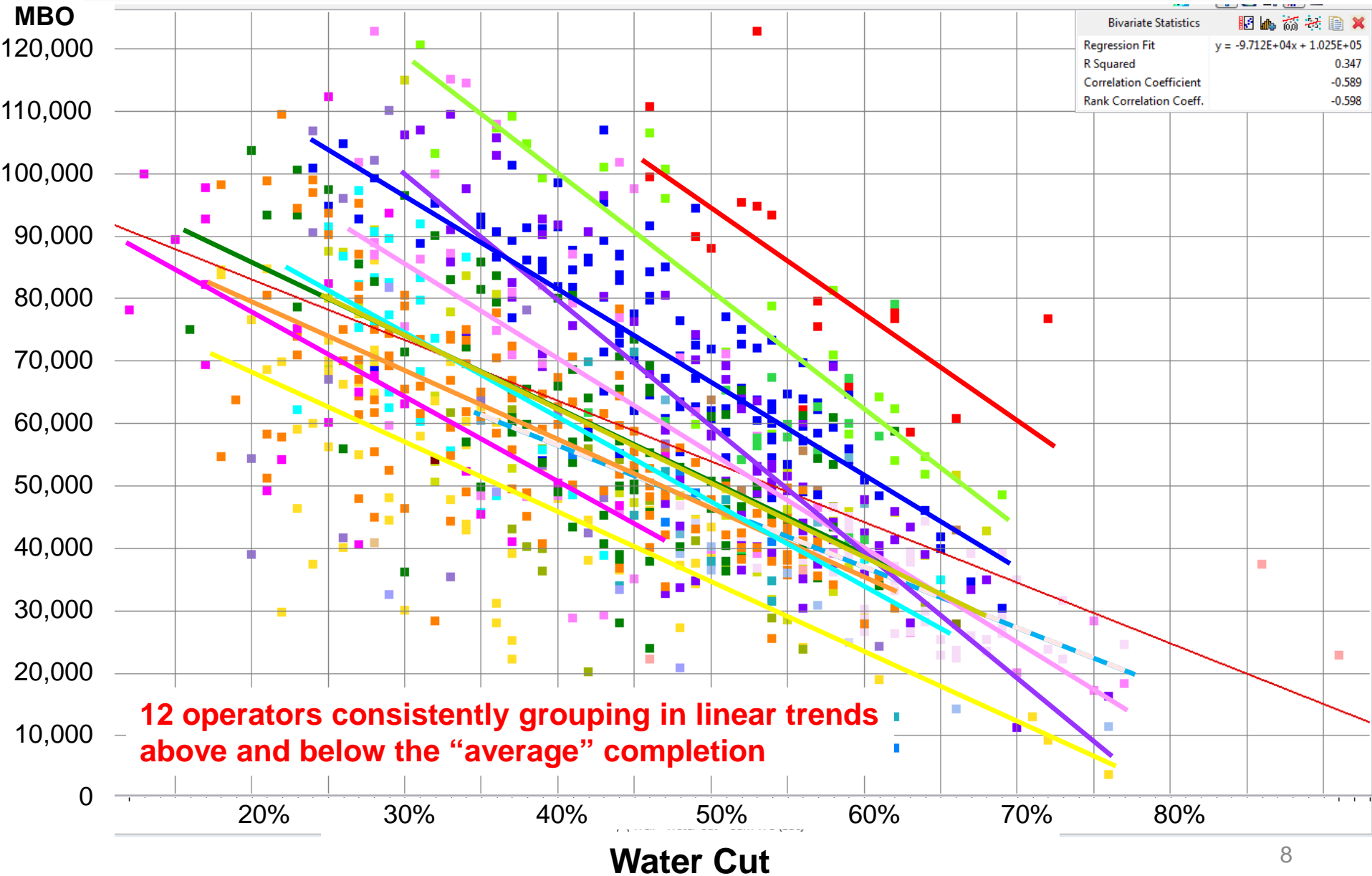


180 Day Production vs. Cum Water Cut

Single Operator

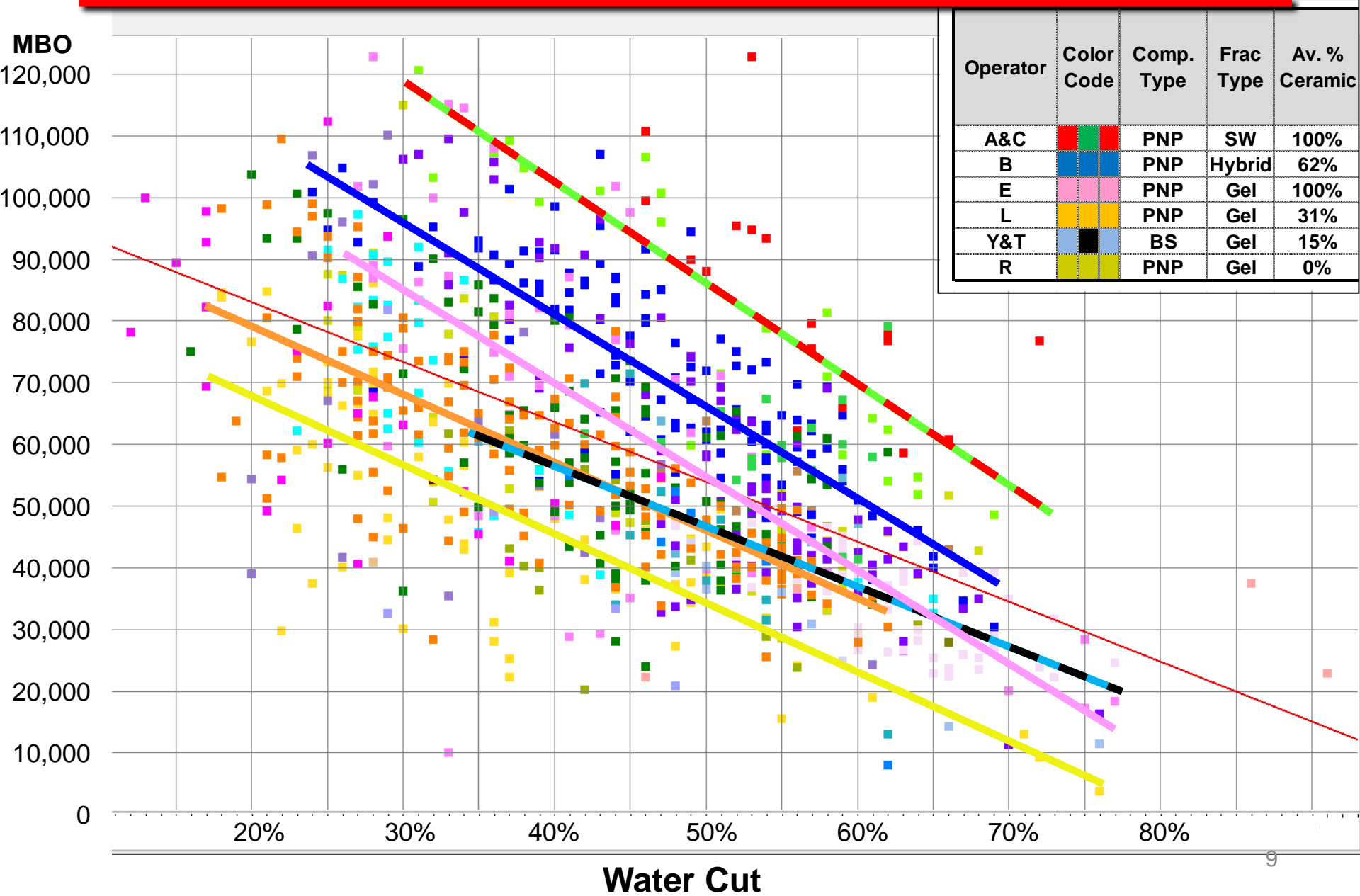


180 Day Production vs. Cum Water Cut



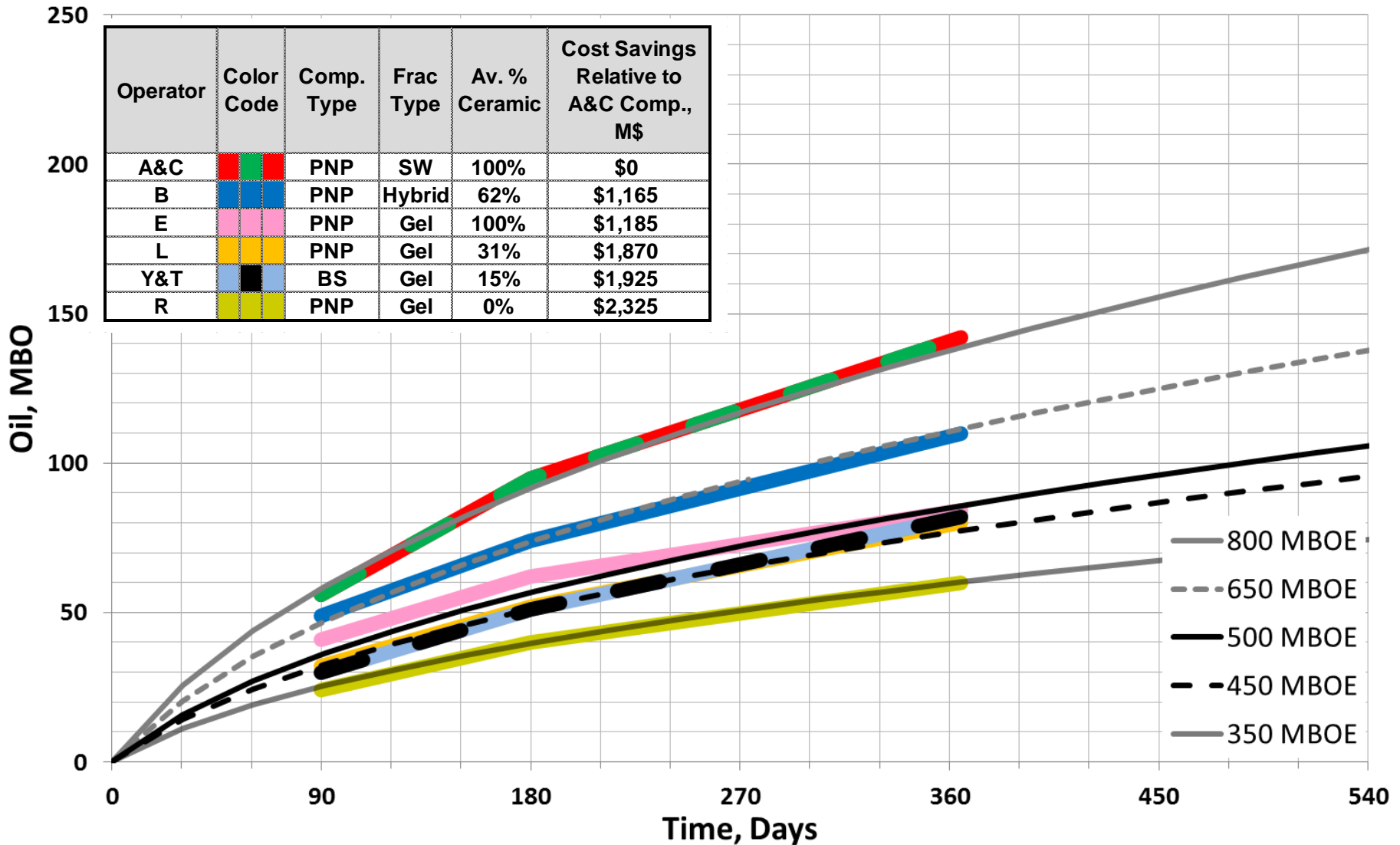
Different Completion Methods

Operator 180 Day Production vs. Water Cut

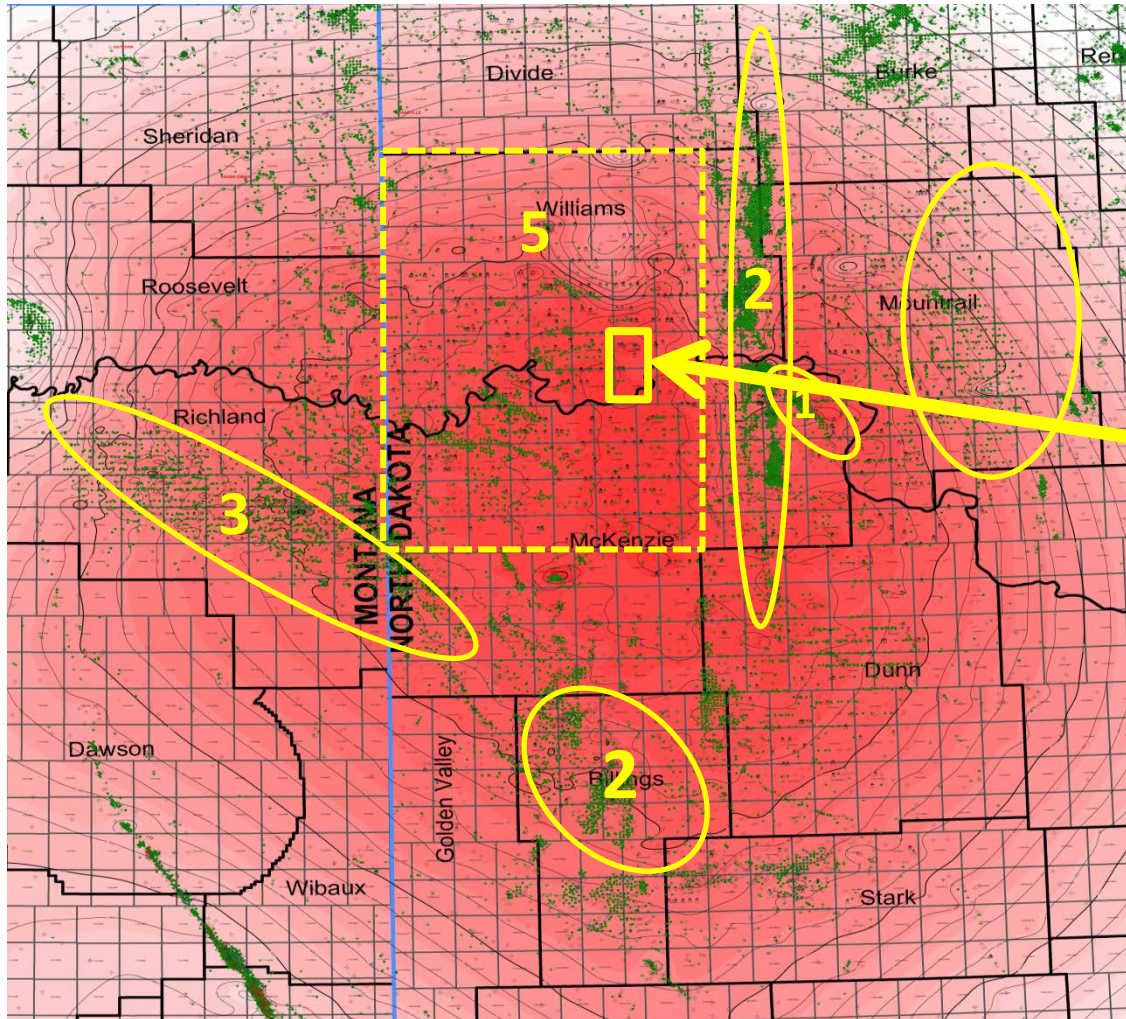


EUR by Completion Technique

45% Water Cut Area



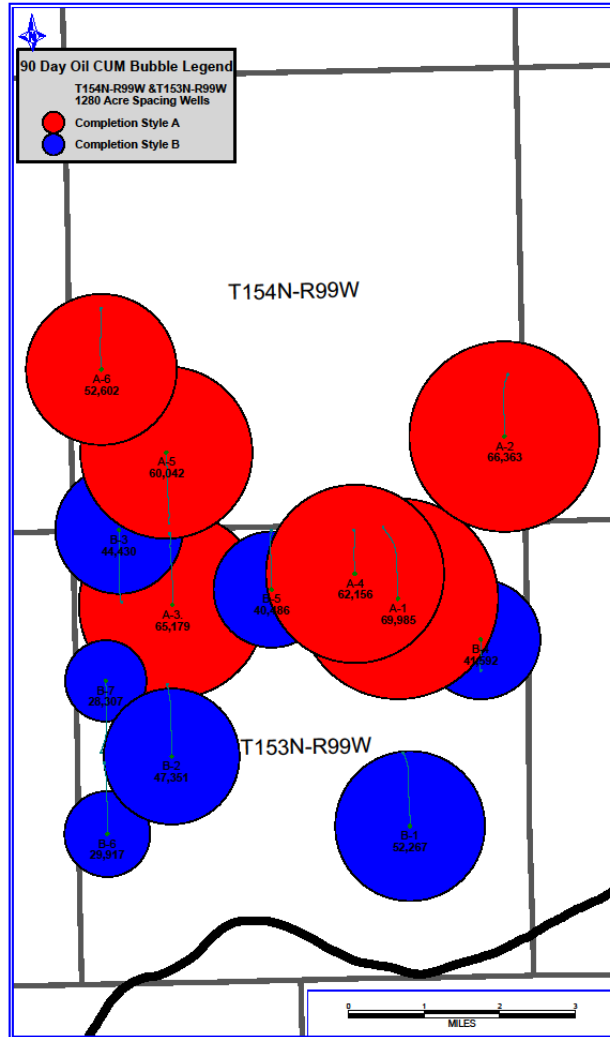
Bakken Case Study #1: South Williams County



**Twp 153 & 154N;
R 99W**

Case Study #1: South Williams County

90-day Cumulative Production Bubble Plot



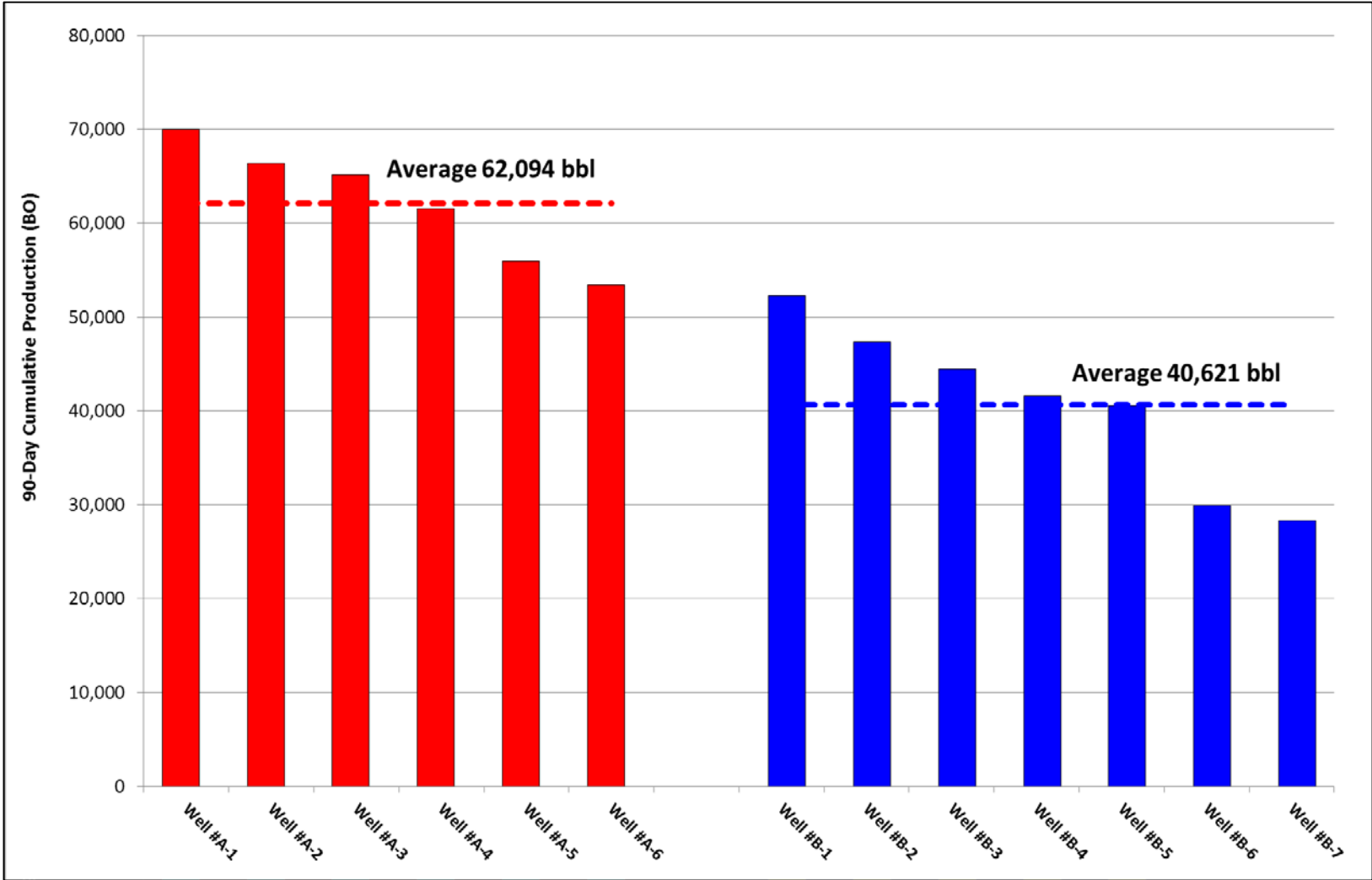
Company A Completion (the “Liberty” Slickwater Design):

- 35 Stages
- Plug and Perf
- Slickwater
- 3.7 Million lb proppant (100% ceramic)

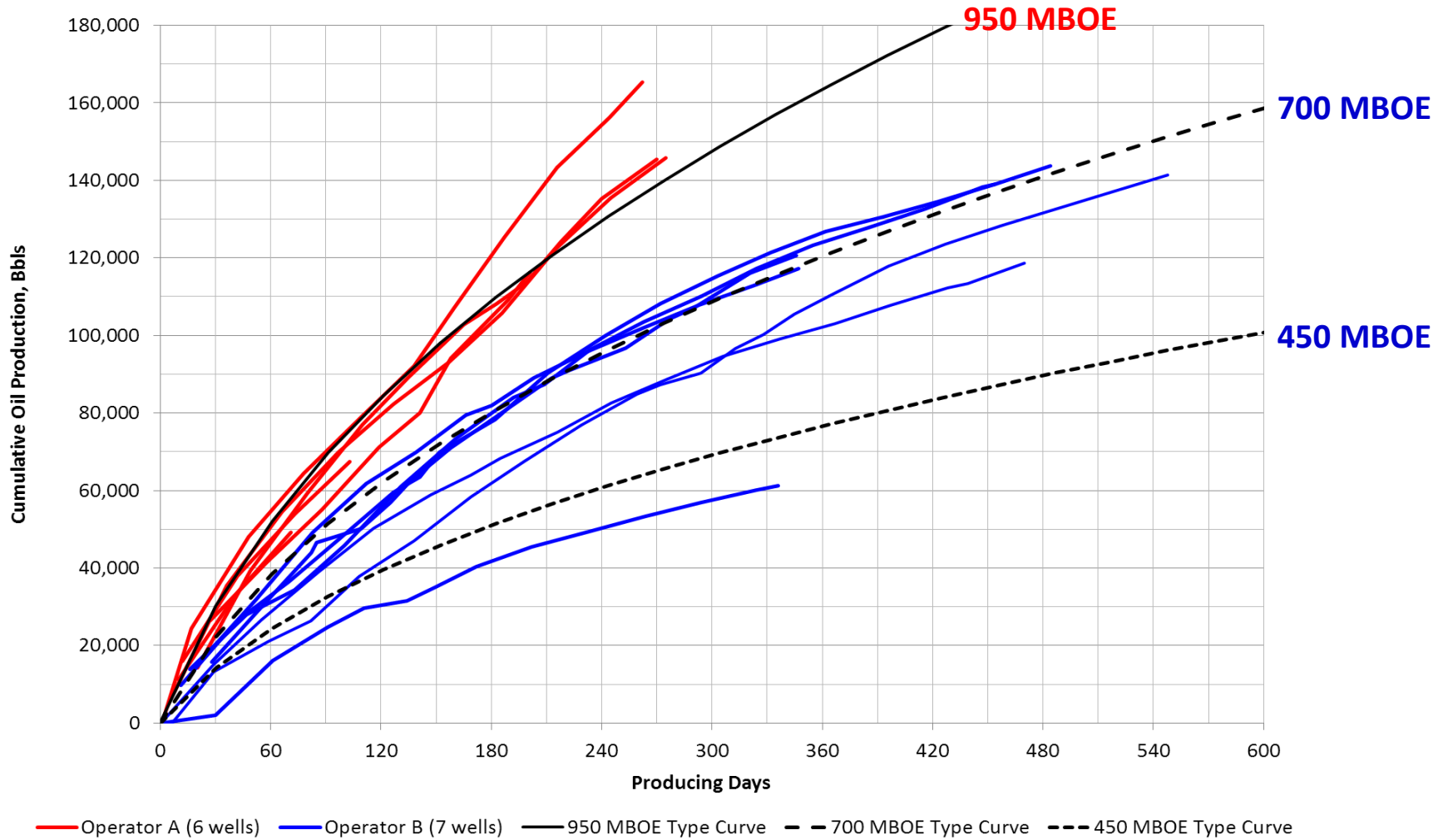
Company B Typical Completion:

- 30 Stages
- Plug and Perf
- X-Linked Gel
- 2.6 Million lb proppant (30% ceramic; 70% sand)

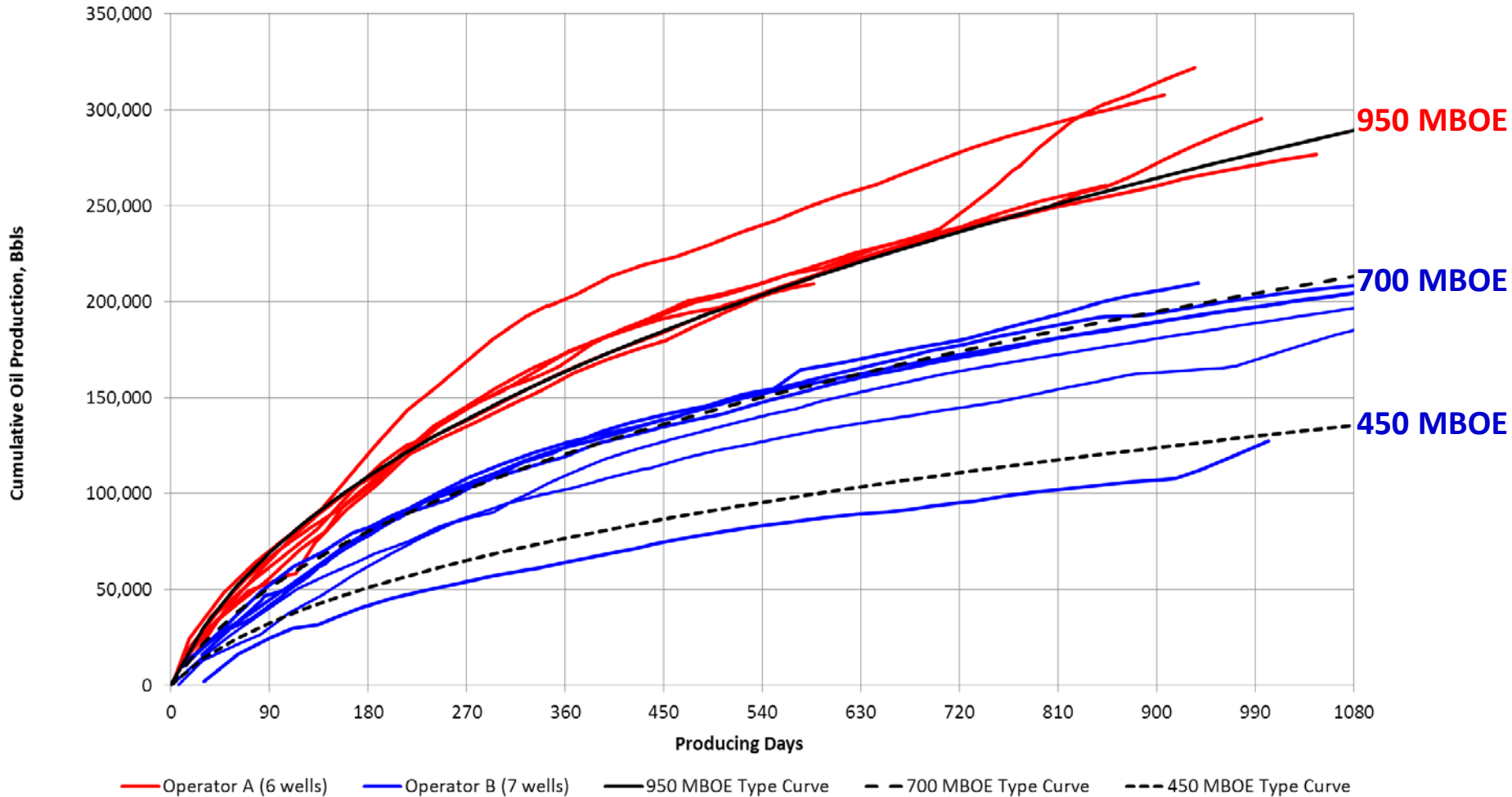
Case Study #1: South Williams County; 90-day Cum Oil



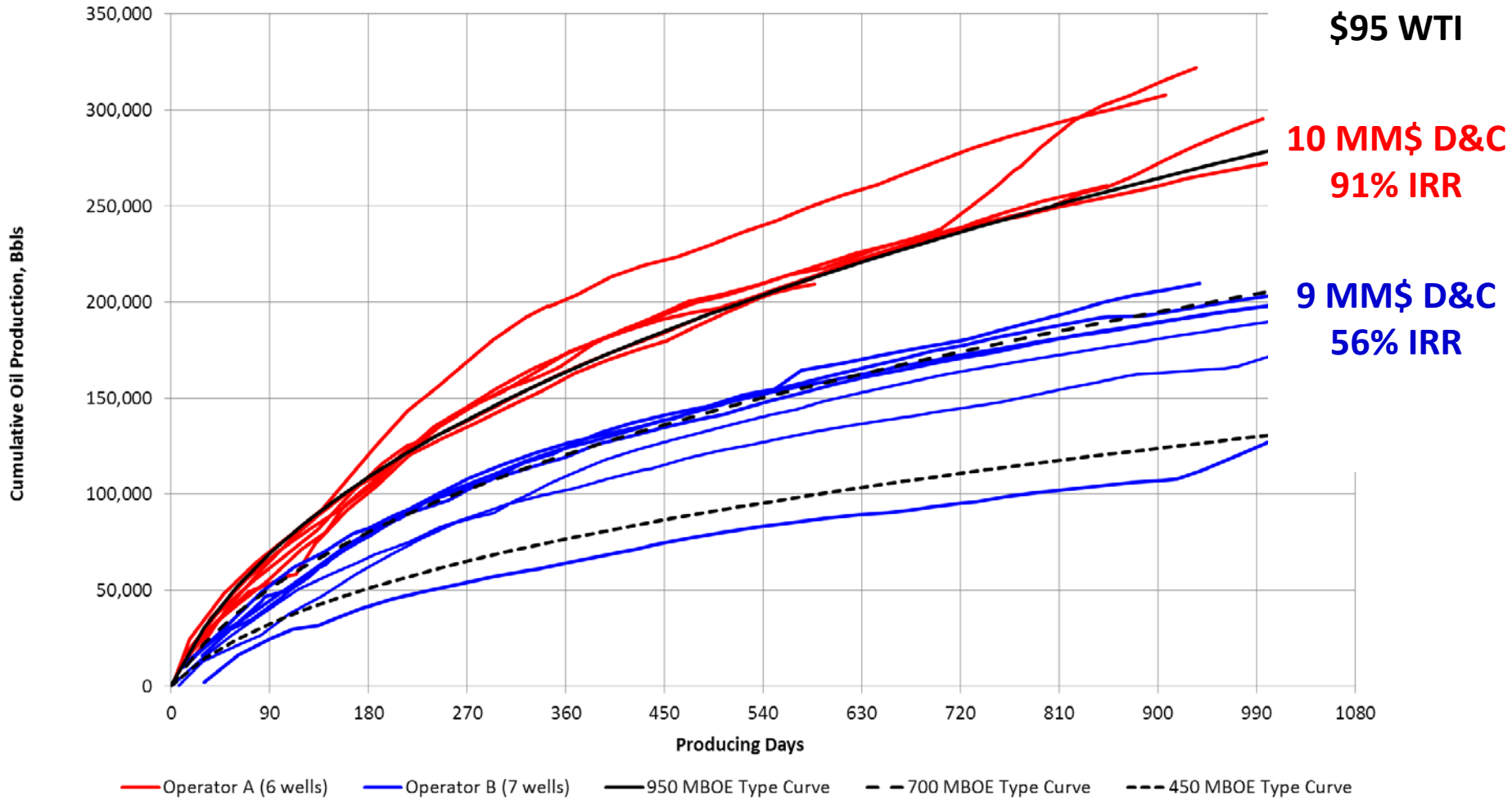
Case Study #1: November 2012 Update



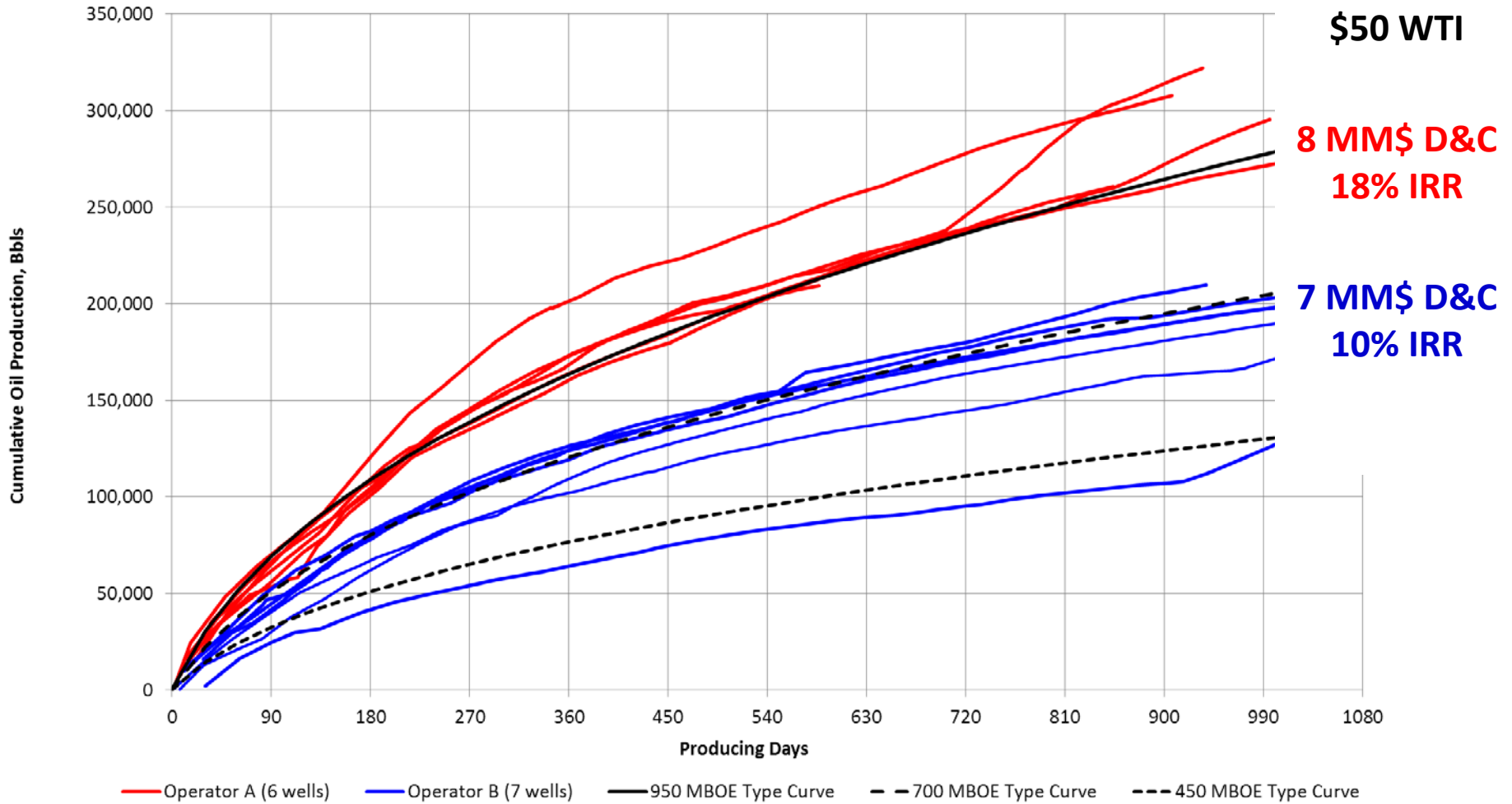
Case Study #1: April 2015 Update



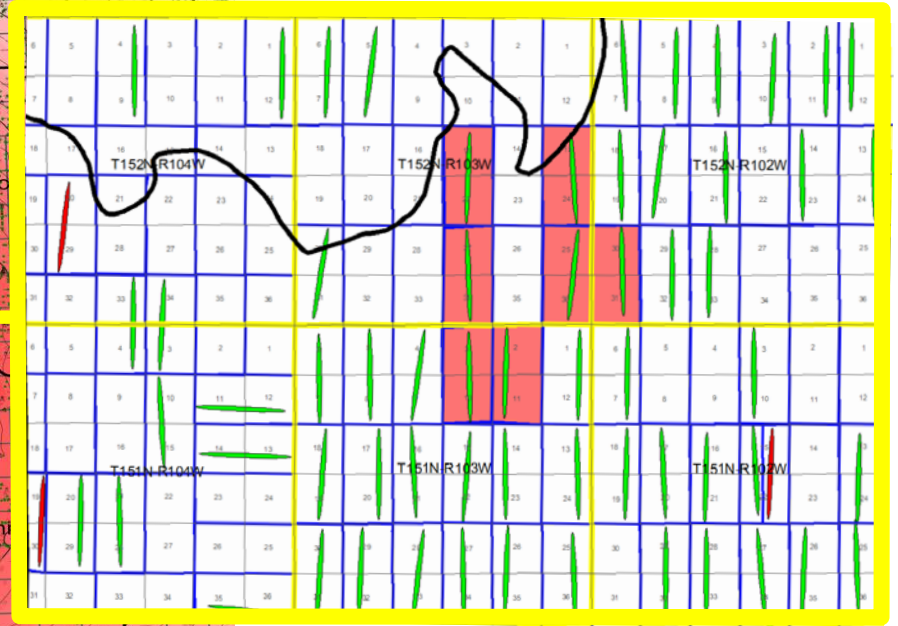
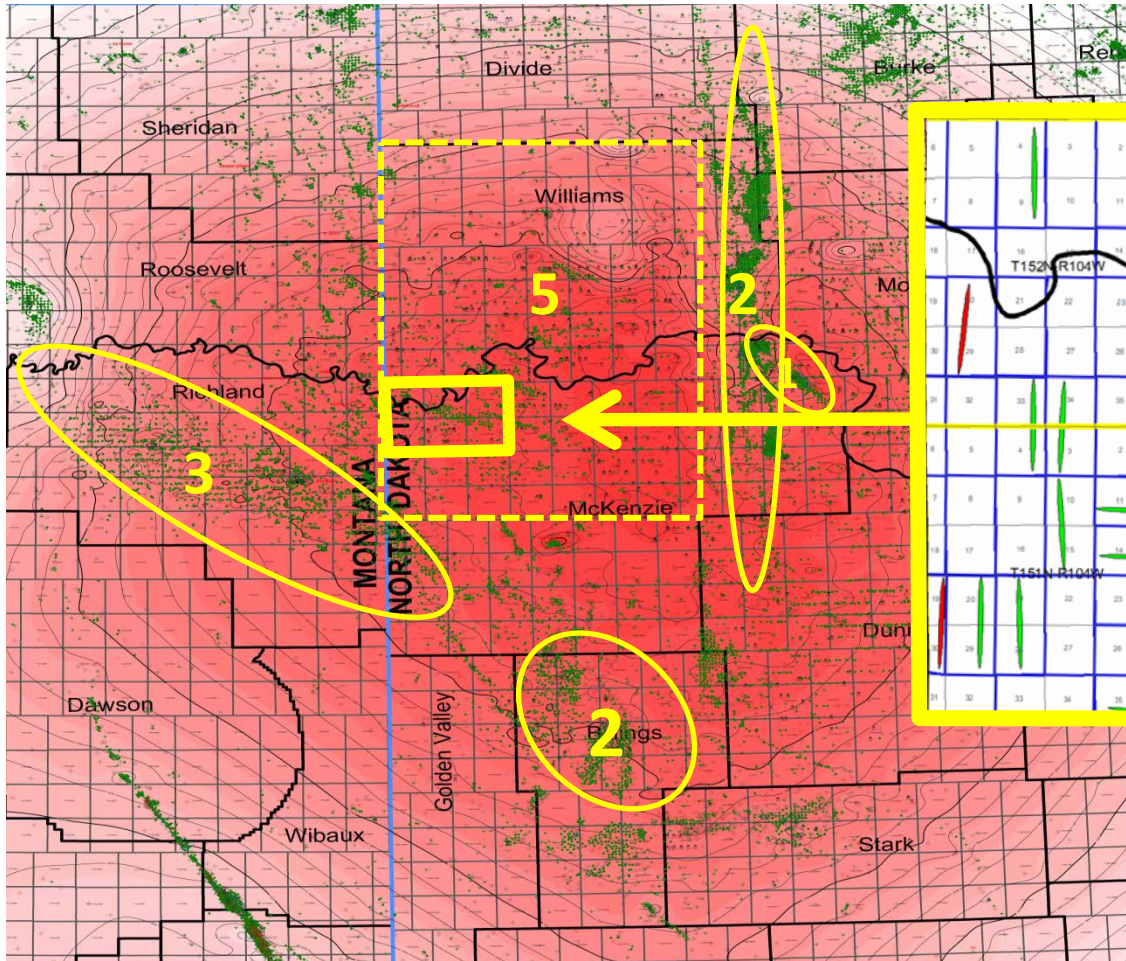
Case Study #1: April 2015 Update



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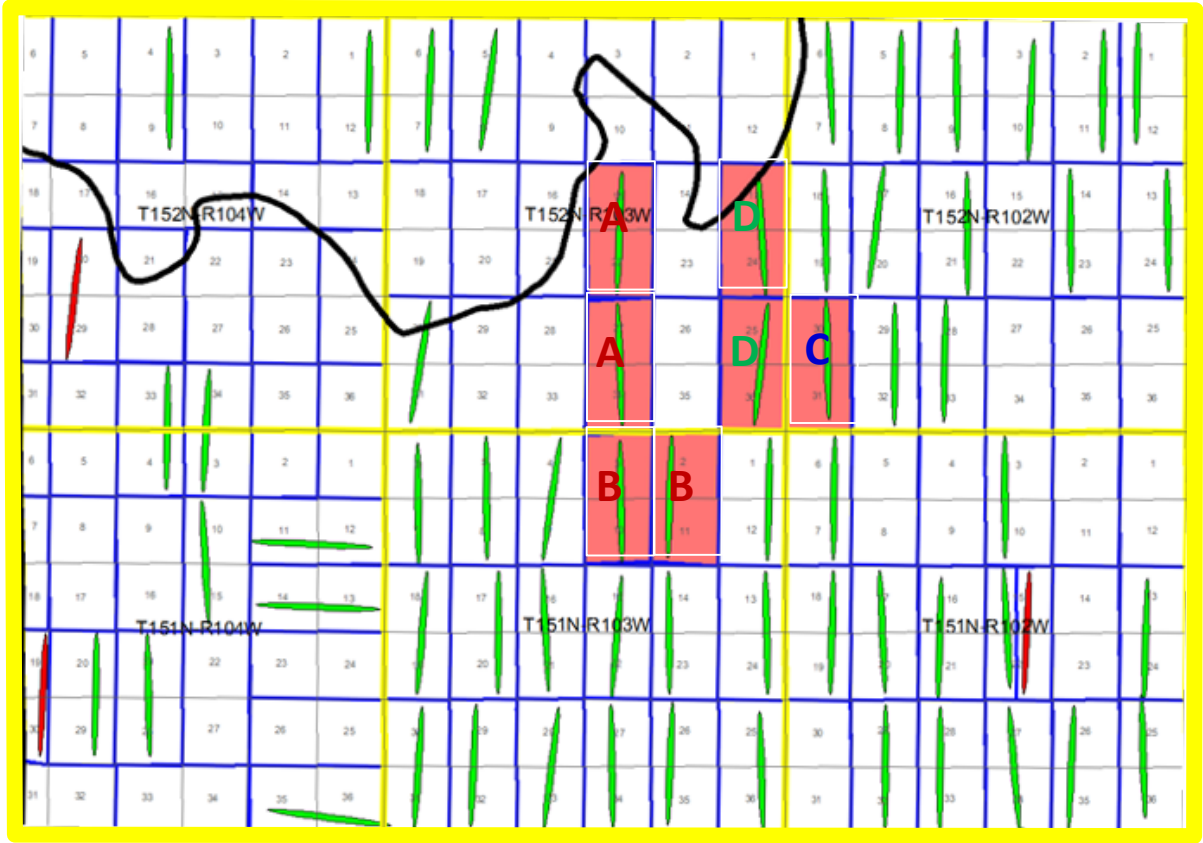


Bakken Case Study #2: NW McKenzie County



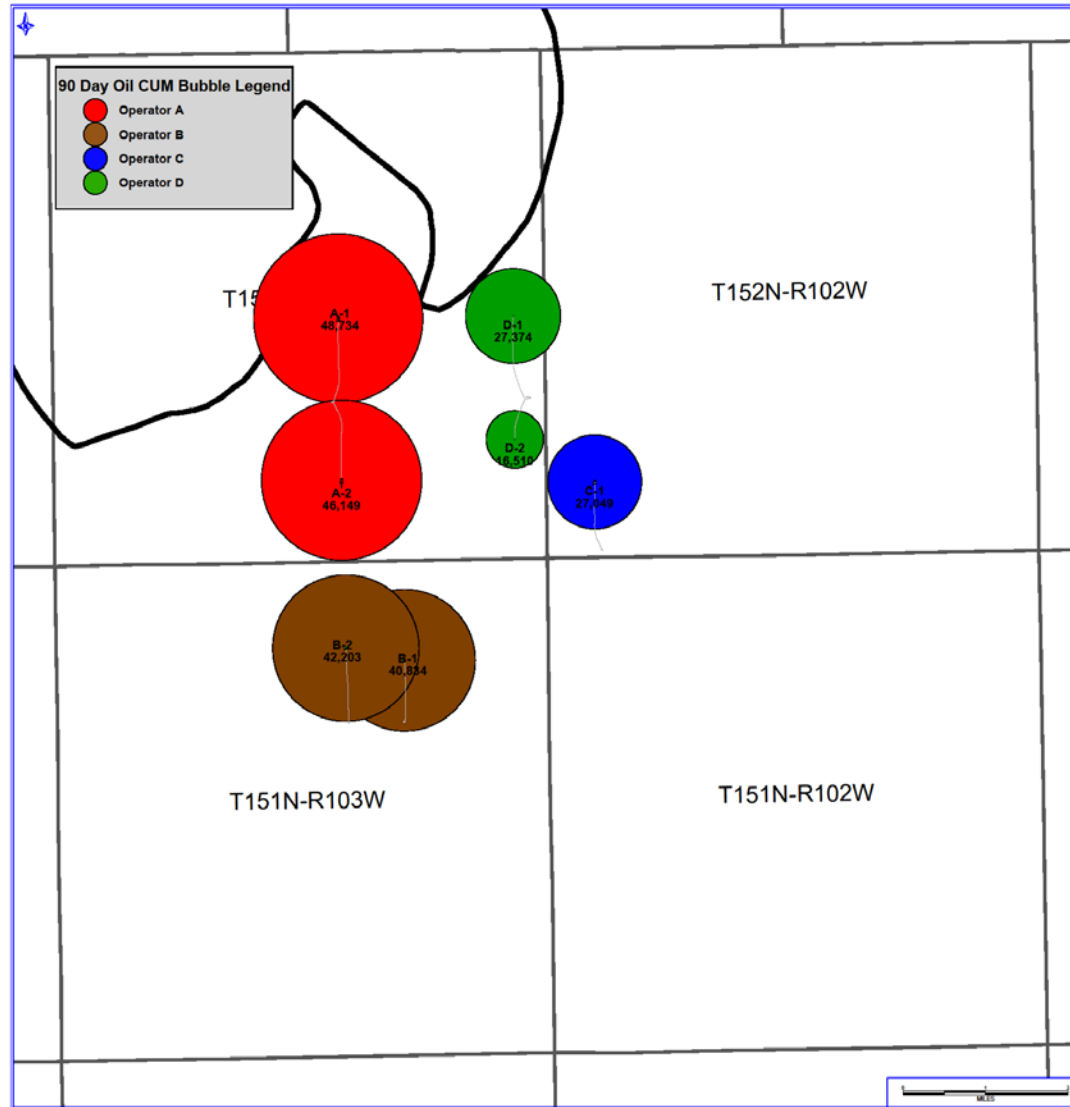
**Twp 151-152N;
R: 102-104W**

Bakken Case Study #2: NW McKenzie County

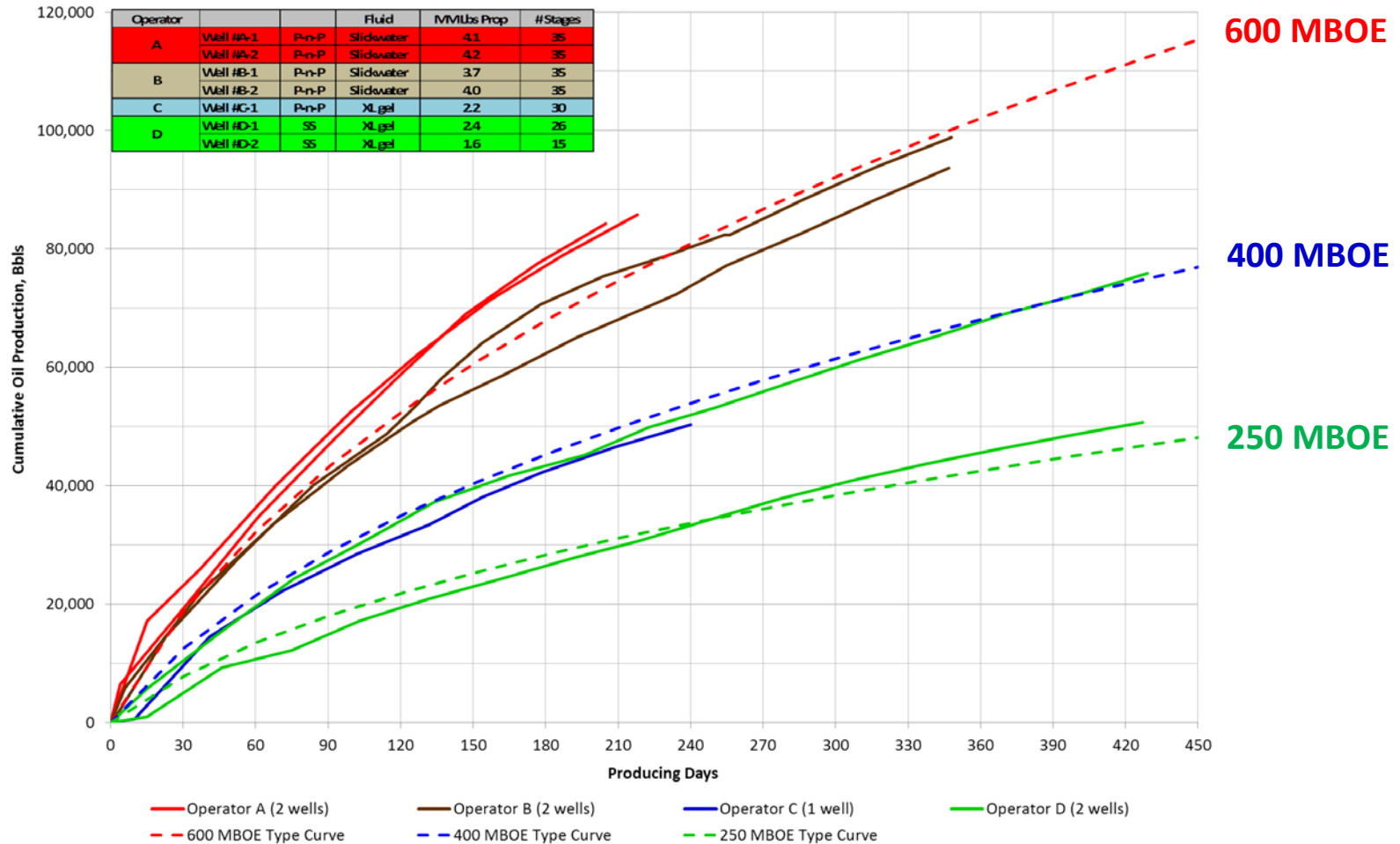


Case Study #2: NW McKenzie County

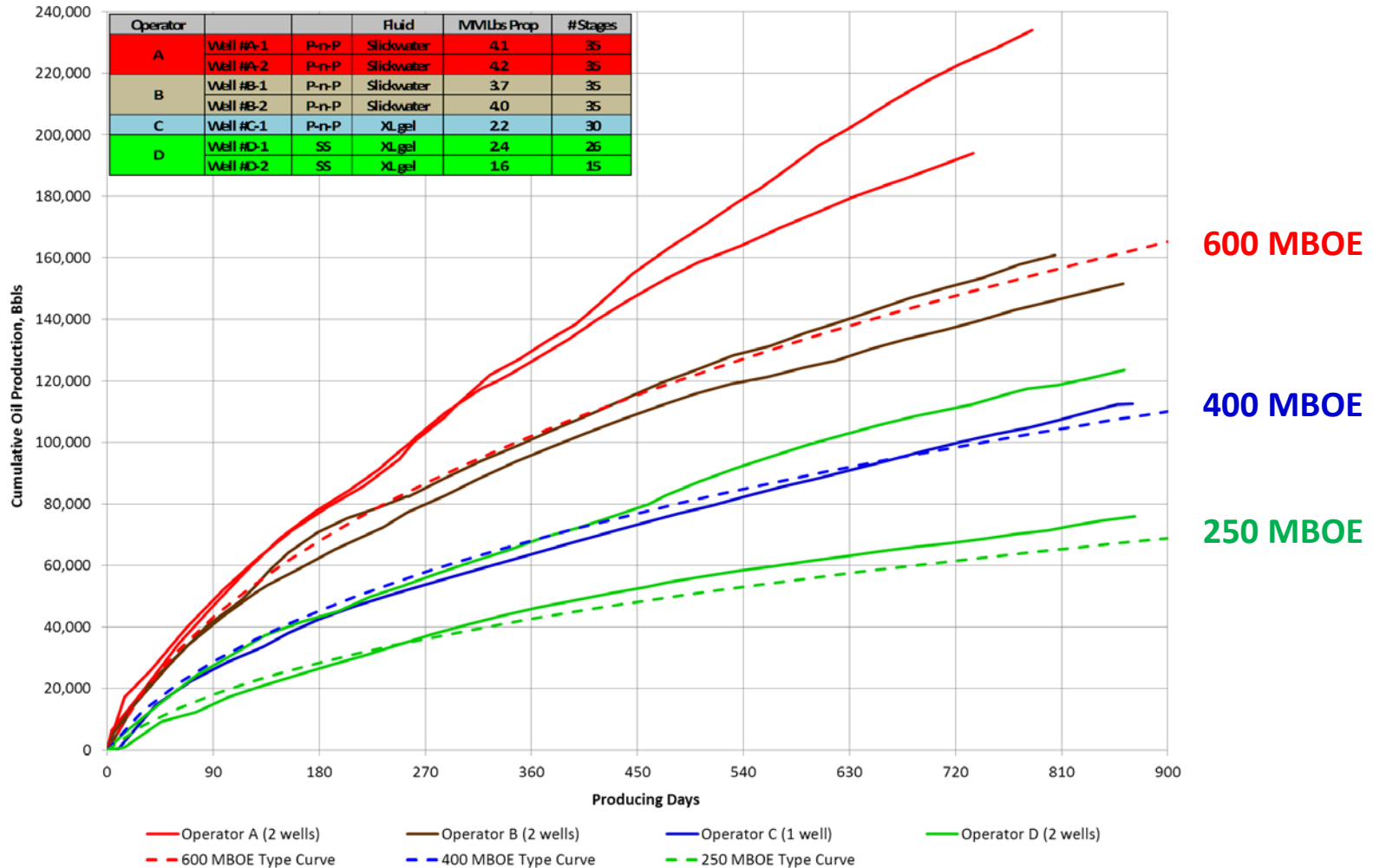
90-day Cumulative Production Bubble Plot



Case Study #2: April 2013 Update

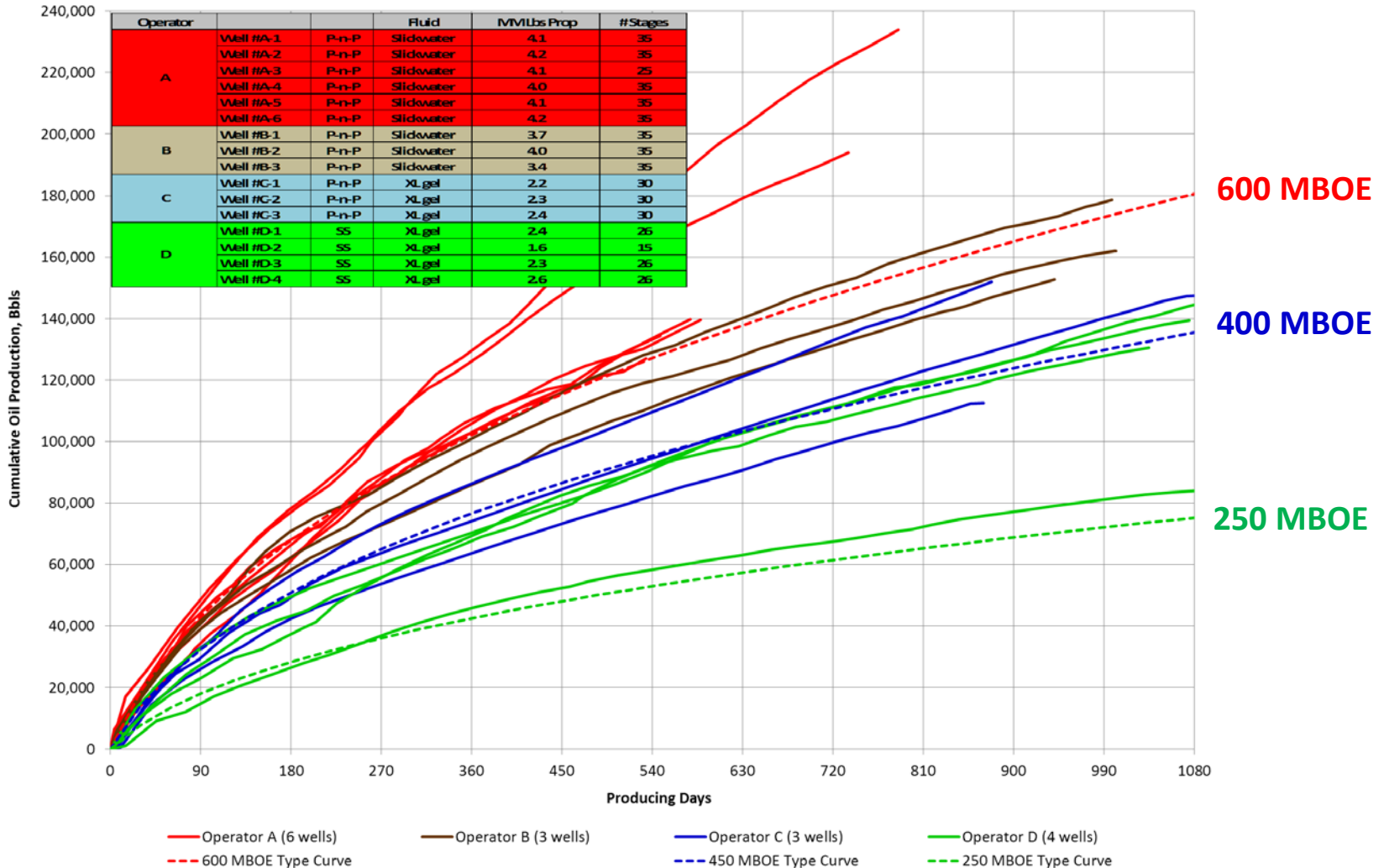


Case Study #2: April 2015 Update



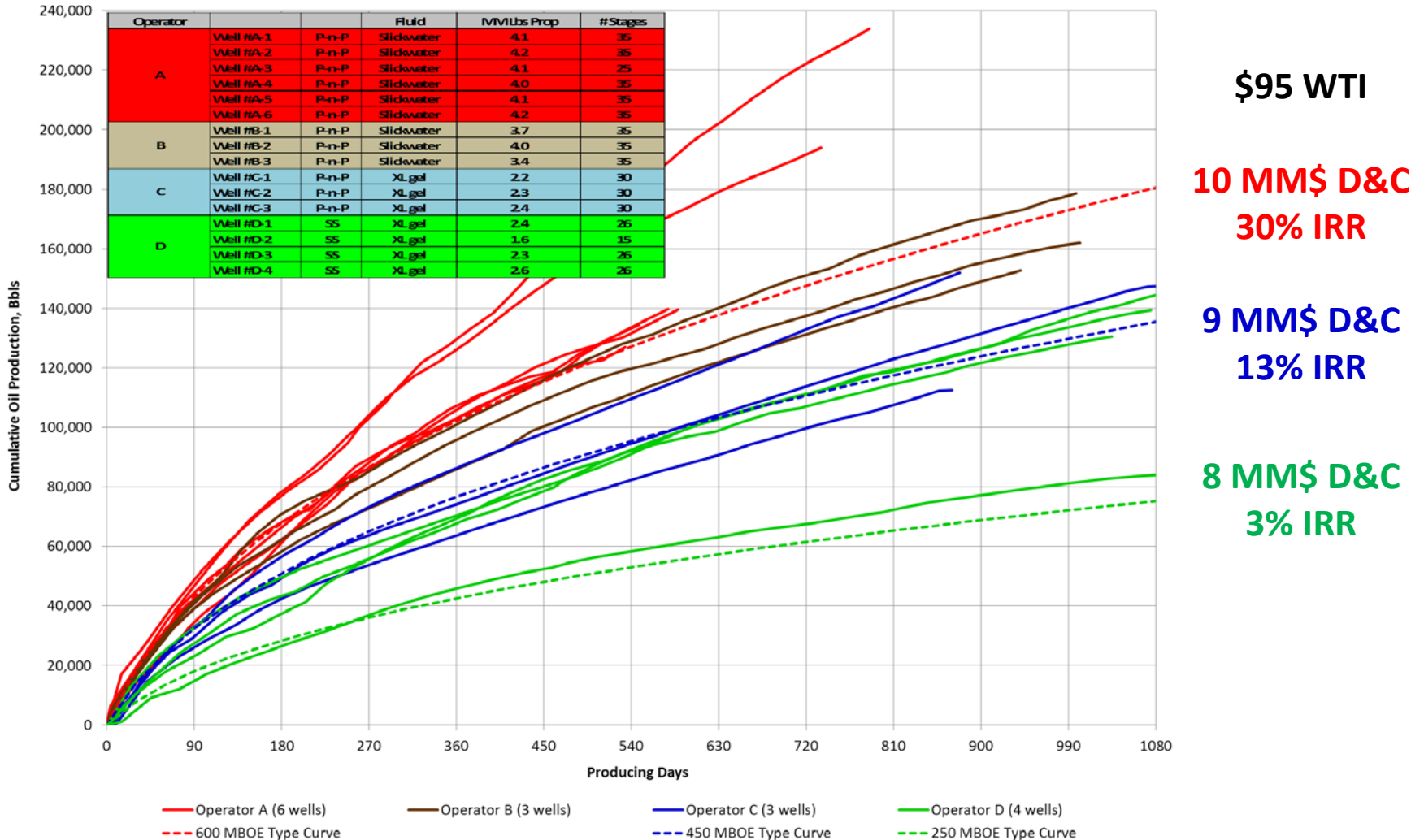
Case Study #2: April 2015 Update

with added wells (SE of T152N-R103W & NE of T151N-R103W)



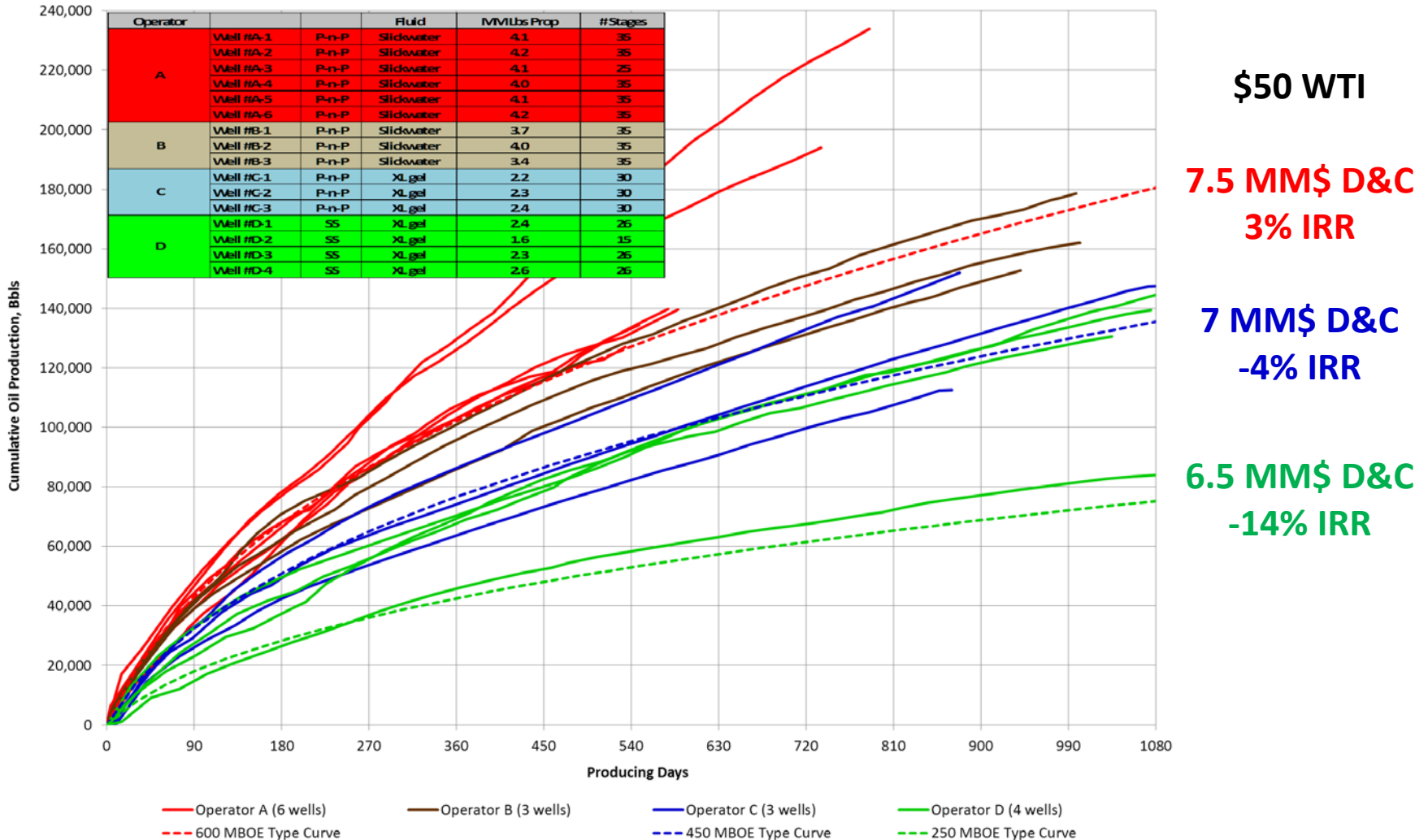
Case Study #2: April 2015 Update

with added wells (SE of T152N-R103W & NE of T151N-R103W)

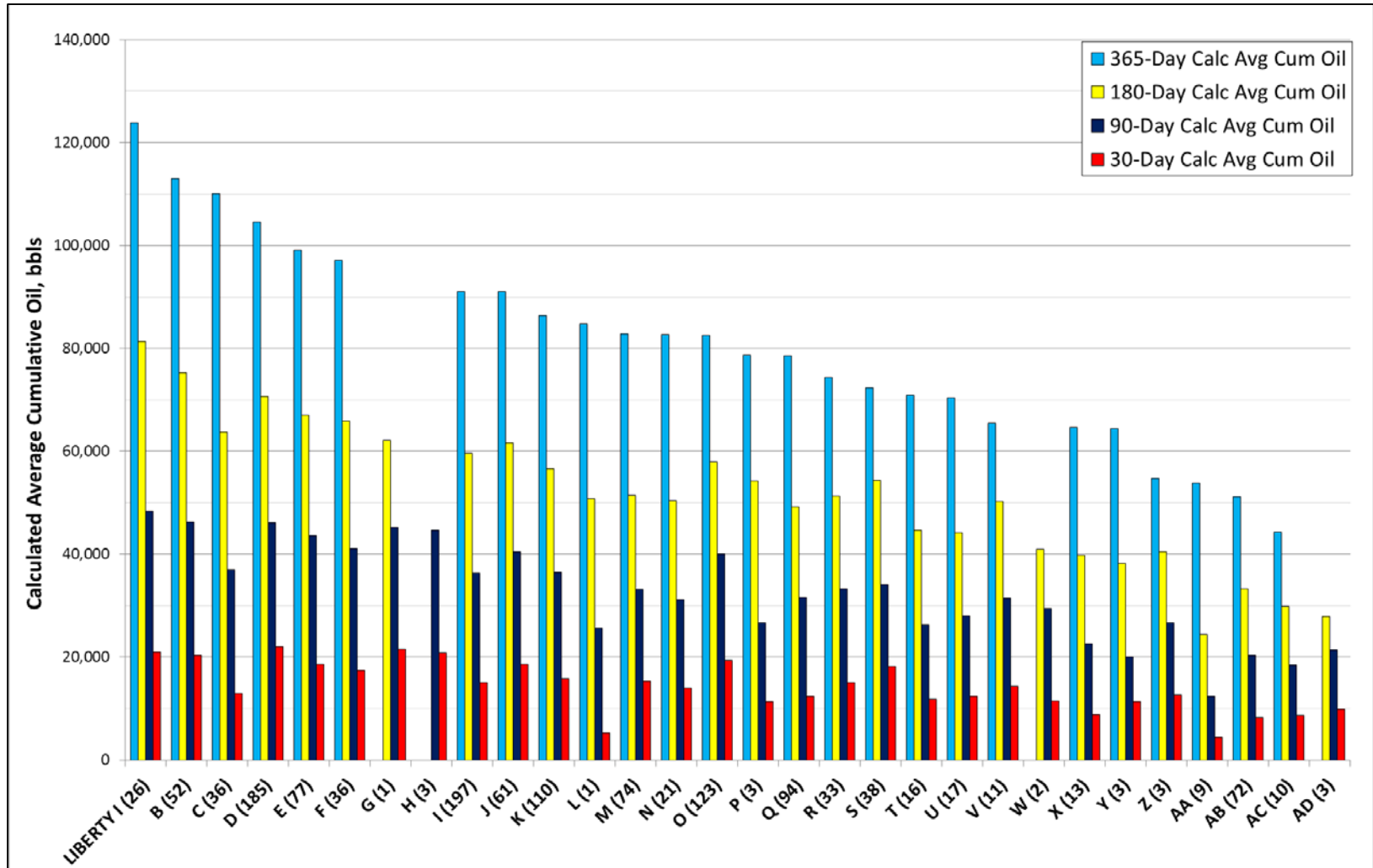


Case Study #2: April 2015 Update

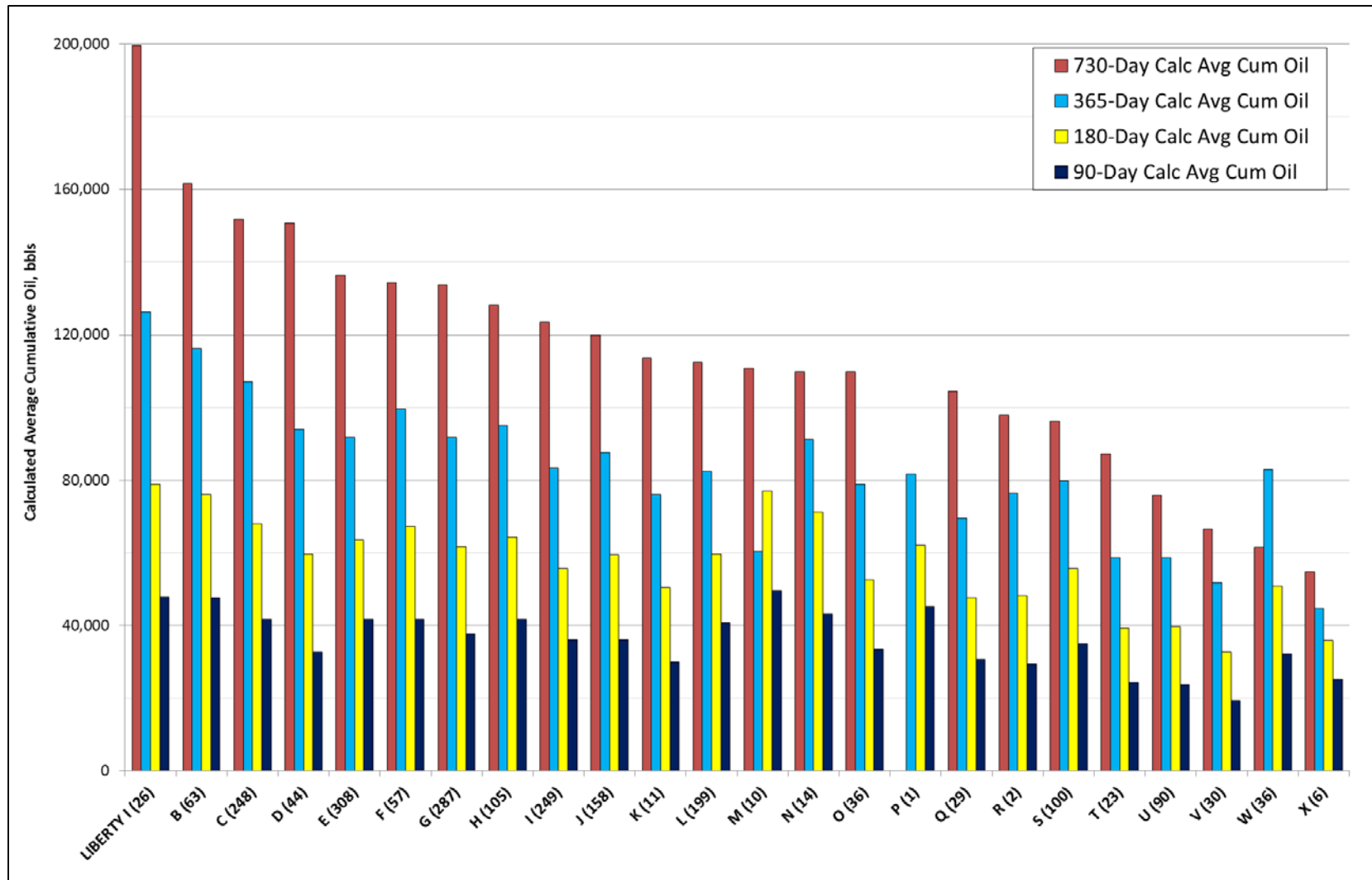
with added wells (SE of T152N-R103W & NE of T151N-R103W)



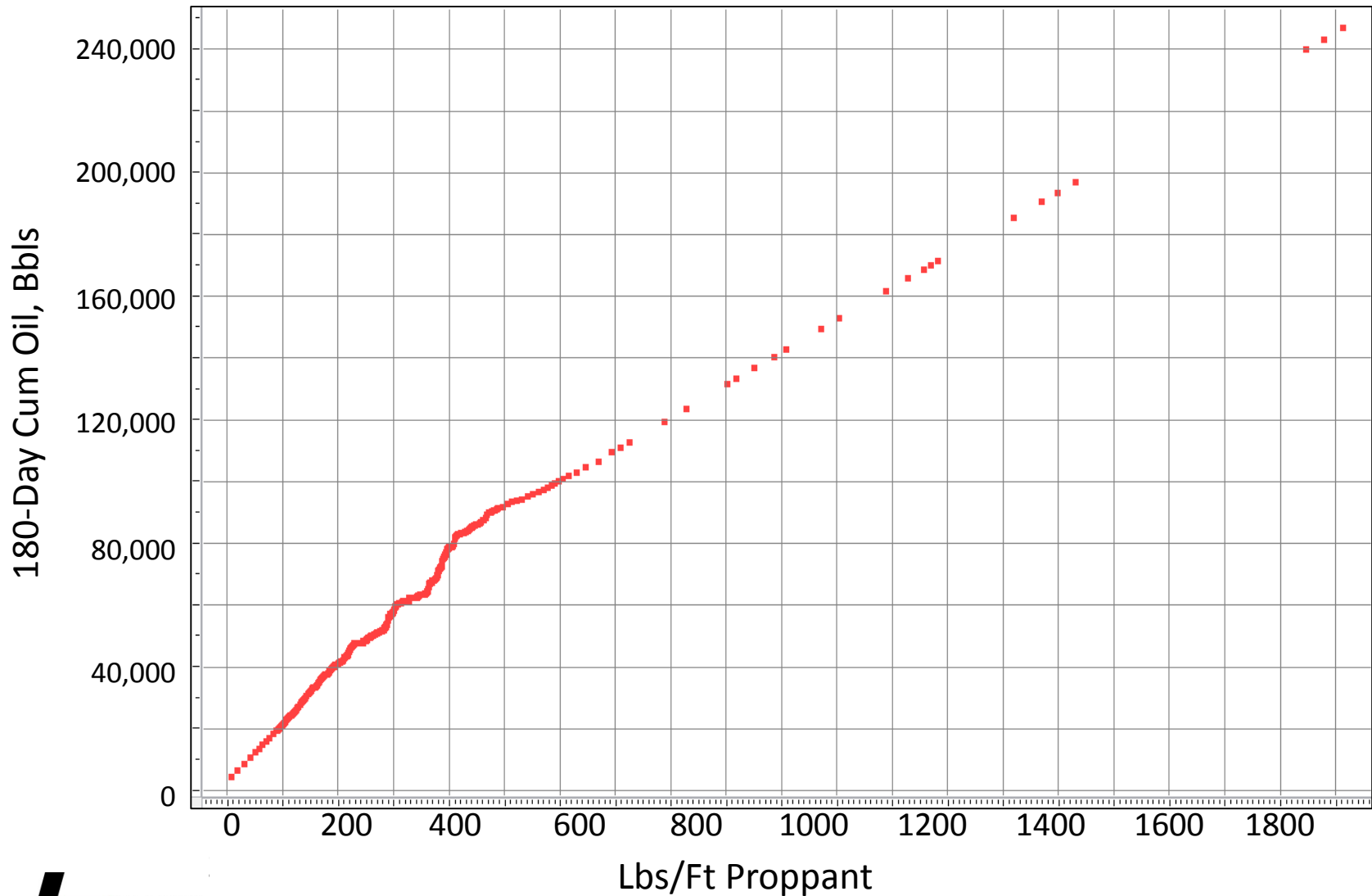
Central Basin (Twp 148-159N, R97-105W) - 1330 Bakken Wells (completions since 1/15/2009, production through Aug 2013)



Central Basin (Twp 148-159N, R97-105W) - 2132 Bakken Wells (completions since 1/15/2009, production through April 2015)



“Current” MB 180-Day Cum Oil vs lbs/ft Transformation (Entire Basin – using June 2015 NDIC update)



Summary

- Completions Matter !!!!
- More “intense” fracturing results in higher initial well production, which results in higher EUR
- Two designs have shown significant production improvement over other completion designs
 - Large Slickwater Fracs with moderate amounts of proppant (the “Liberty” design)
 - Large volumes of sand (1000-2000 lb/ft) with XL gel fluids
- Current “Super Frac” Optimization:
 - Cost Reduction !!
 - Slickwater
 - Larger proppant volumes
 - Perforation cluster optimization

Thank You !!!

