

Buffalo Wallow Field Study

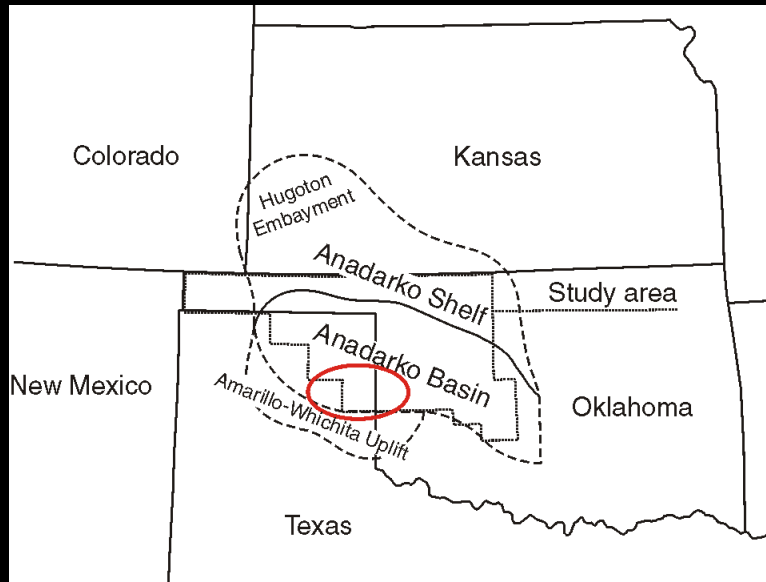
For: Oklahoma Geological Survey

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Brian Rothkopf, Forest Oil Company
Issac Paterniti, Halliburton

Overview

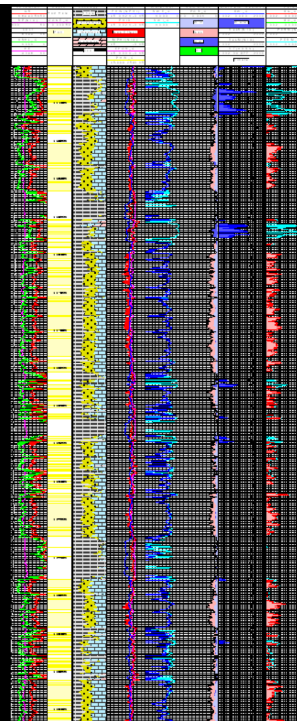
- Reservoir Overview
- Field Wide Study Results
- The Fracture Fluid System
- Core Tests & Results
- Case Studies
 - Lease Acreage #1 (15 Wells)
 - Lease Acreage #2 (16 Wells)
 - Lease Acreage #3 (14 Wells)

Granite Wash Reservoir

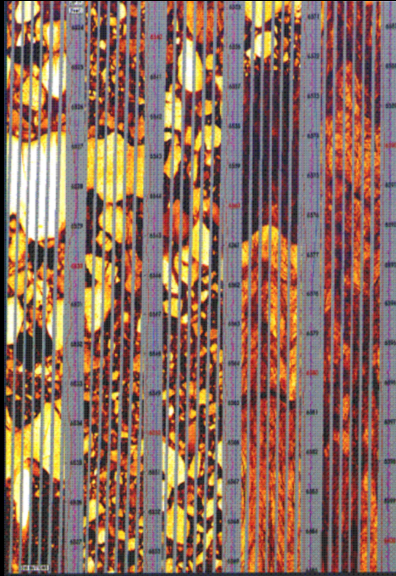


Granite Wash Reservoir

- Wash Types:
 - Morrowan (Historically, Primary Play)
 - Cherty
 - Atokan
 - Chert to Carbonate
 - Lower & Middle Cherokee
 - Typically Carbonate
 - Red Fork
 - Commonly carbonate w/ Granatic Materials (local)

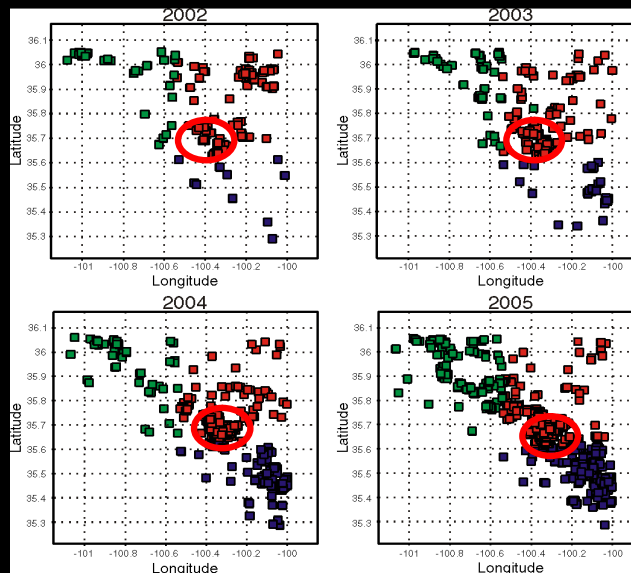


Granite Wash Reservoir



- Highly Lenticular
- Variable Permeability
- Variable Porosity
- Variable Water Saturation
- Variable R_w
- Difficult OH environment for extensive log sweeps
- Porosity Thickness (ϕH) is **not** directly related to Permeability Thickness (kH)

Drilling Explosion Wheeler, Hemphill & Roberts Counties



Statistical Analysis of Treatments

Production Trends vs. Fracture Variable 101 Wells Buffalo Wallow Field

Initial Production

30 Day Cum's

60 Day Cum's

90 Day Cum's

180 Day Cum's

Net Pay

Gross Pay

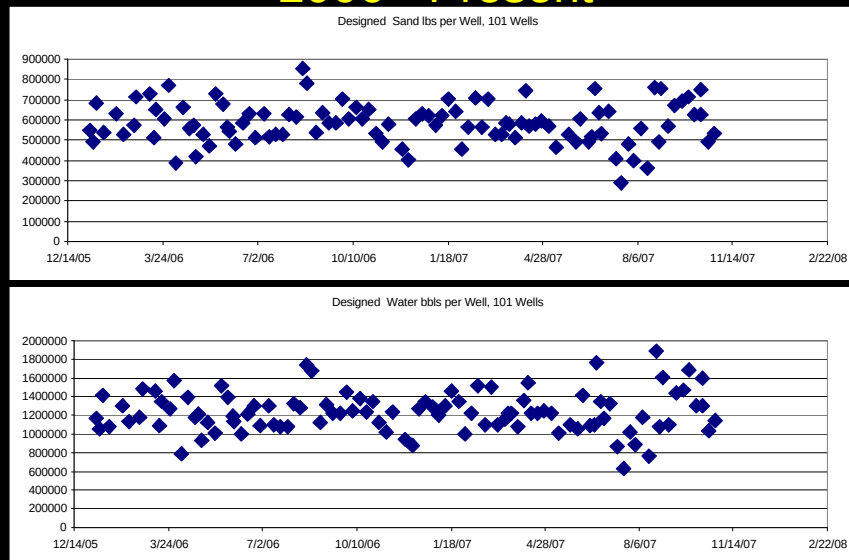
Fracture Rate

Fracture Volume

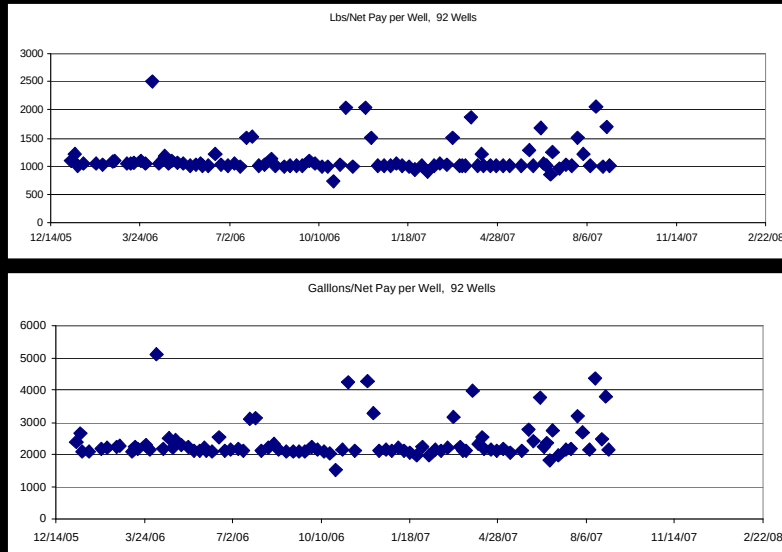
Proppant Type & Mass

See SPE 104546 for more details

Buffalo Wallow Field Development 2006 - Present



Buffalo Wallow Field Development 2006 - Present



A Water Frac is a Water Frac is a Water Frac RIGHT?

Conventional Fluid Systems

1. Conventional Friction Reducer
2. Conventional Surfactant
3. Clay Control (typically KCL)
4. Biocide

Adaptive Fluid Systems

1. Anionic Friction Reducer
2. Deflocculant / Viscosity Reducing Agent
3. Microemulsion Surfactant
4. Surface Modification Agent on Sand
5. Clay Control (typically KCL)
6. Biocide

Core Testing

- 23 Standard Sidewall Cores
- Previously Tested by 3rd Party for Initial Permeability

Table 1—Regained Permeability Testing for Lower Permeability Granite Wash Side-Wall Core Samples

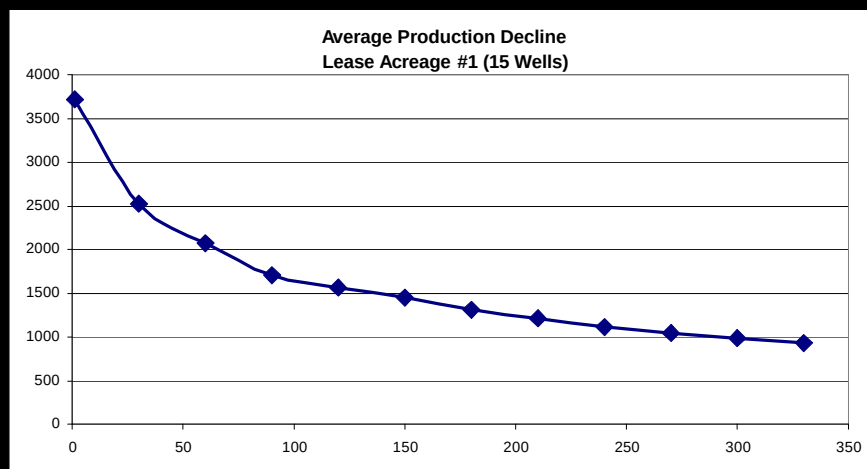
	No. of Tests	Regained Permeability, %
Baseline	3	68
Surfactant comparison		
ME	8	82
CS	9	73
Deflocculant comparison*		
With DE	6	87
Without DE	2	68
SMA comparison		
With SMA	7	67
Without SMA	10	84

*Tests only performed with new anionic friction reducer.

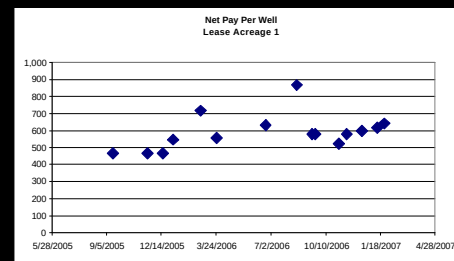
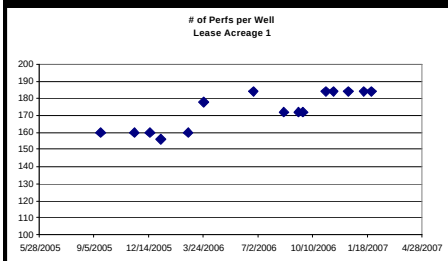
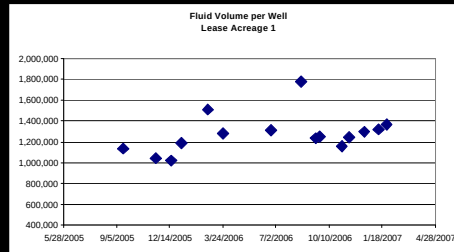
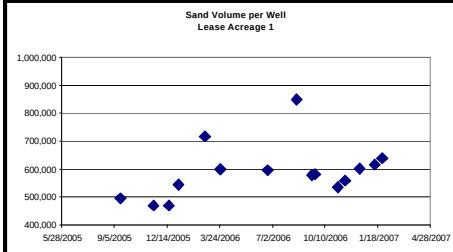
Case Study

- 3 Lease Ranch Areas within the Buffalo Wallow Field
- Lease Acreage #1 (15 Wells)
- Lease Acreage #2 (16 Wells)
- Lease Acreage #3 (11 Wells)
- All wells have 4 fracture treatments
- All treatments targeted 80 bpm, only wells with a standard variation less than 2% are included in this study.

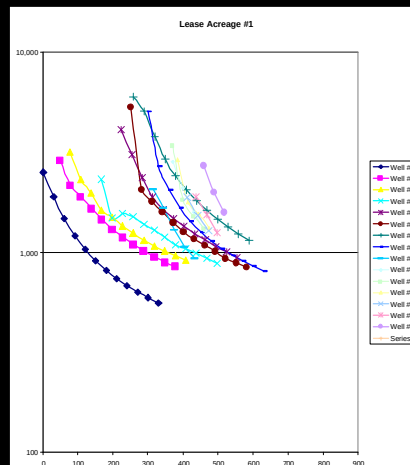
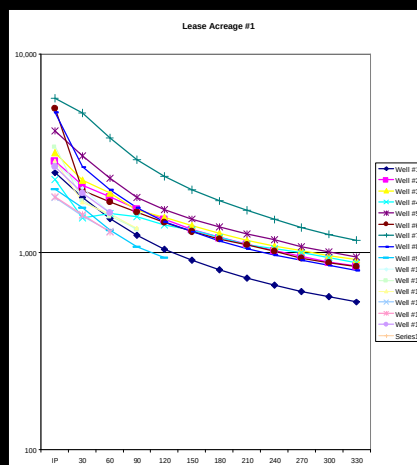
Lease Acreage #1



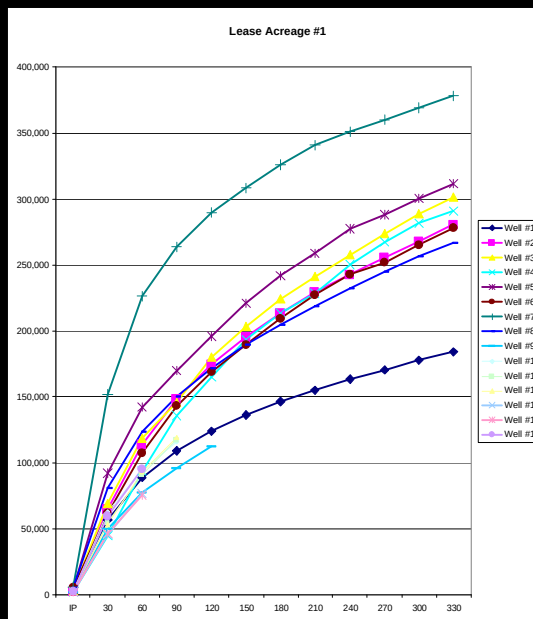
Lease Acreage #1



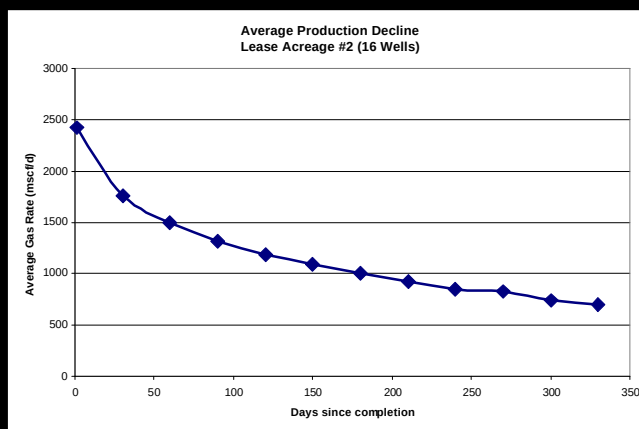
Lease Acreage #1



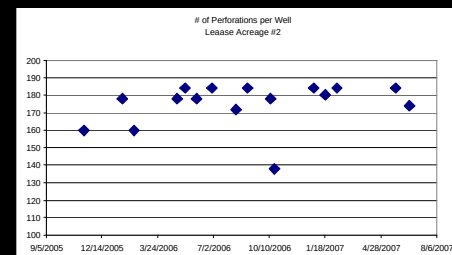
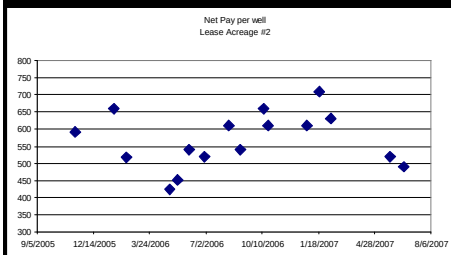
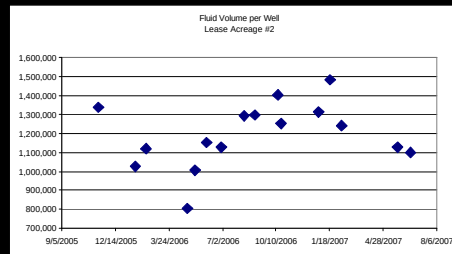
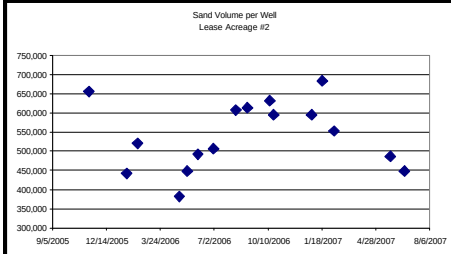
Lease Acreage #1



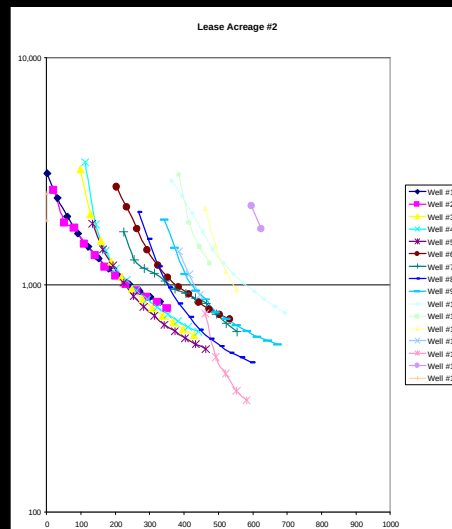
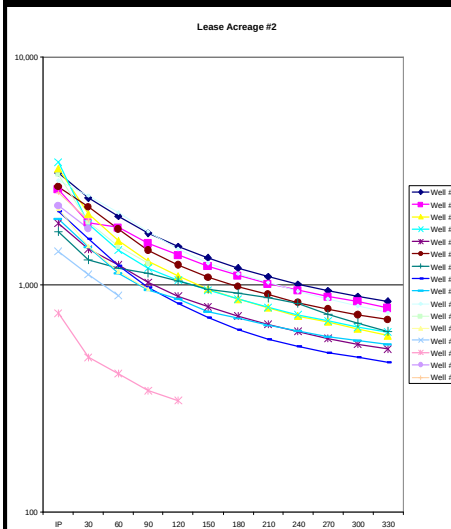
Lease Acreage #2



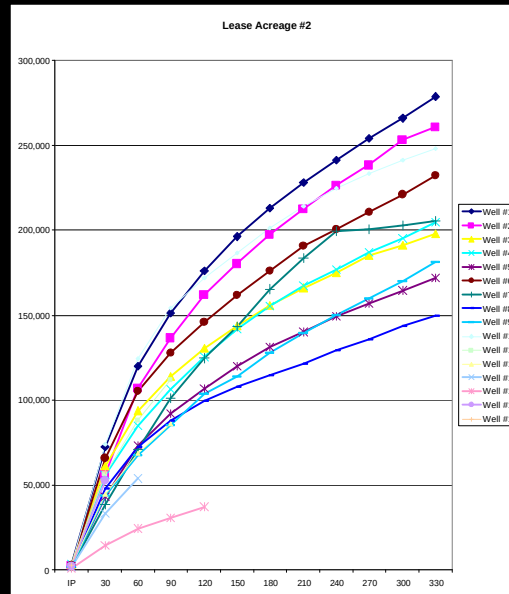
Lease Acreage #2



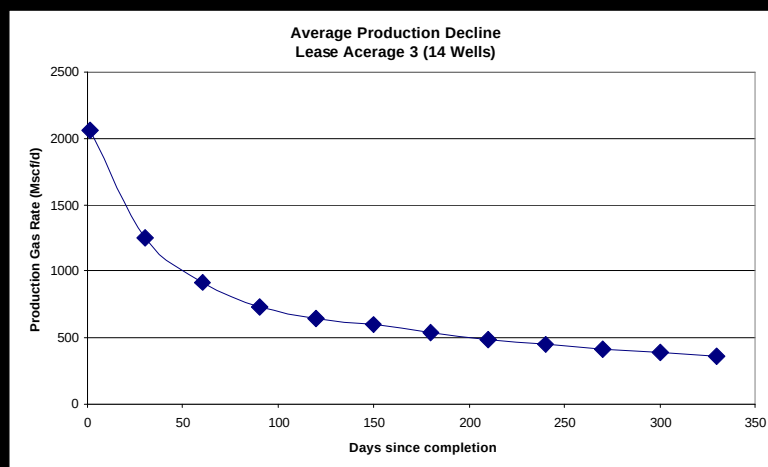
Lease Acreage #2



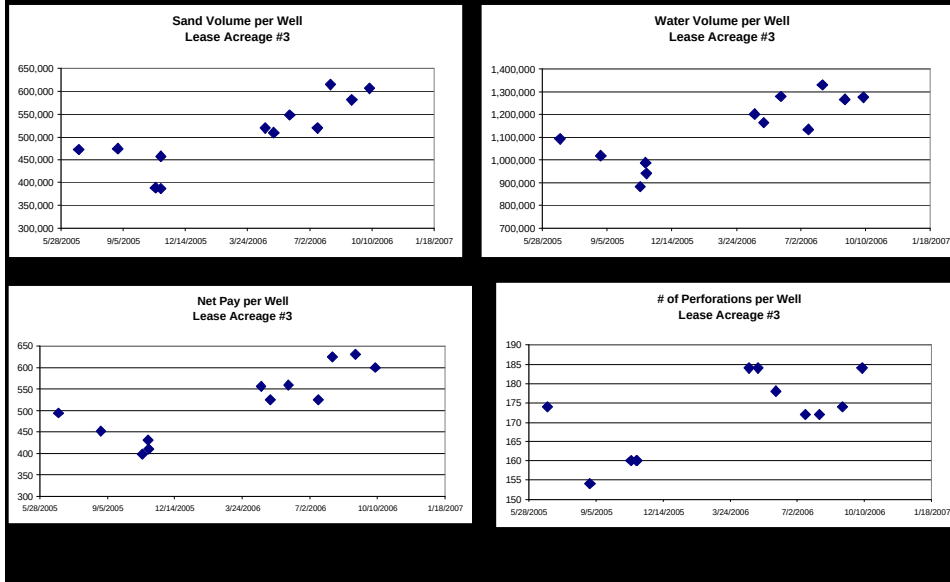
Lease Acreage #2



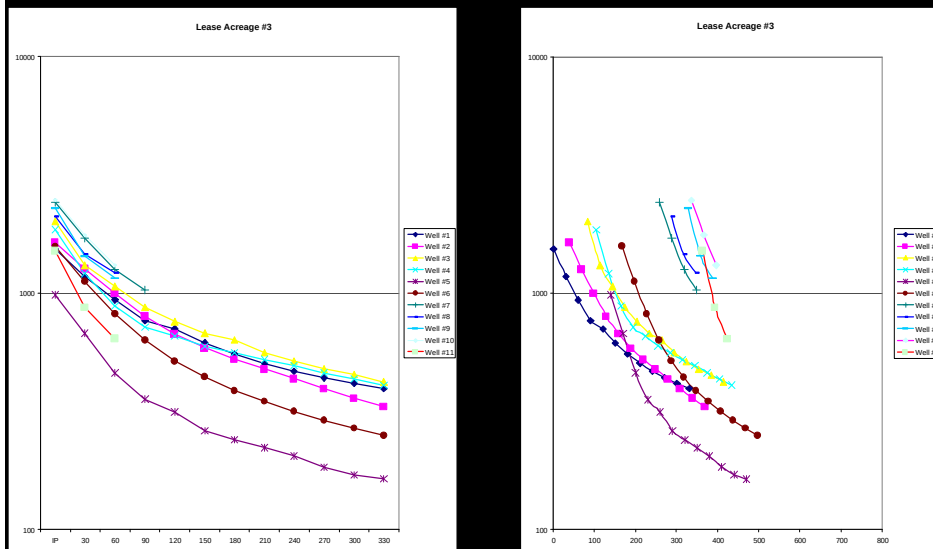
Lease Acreage #3



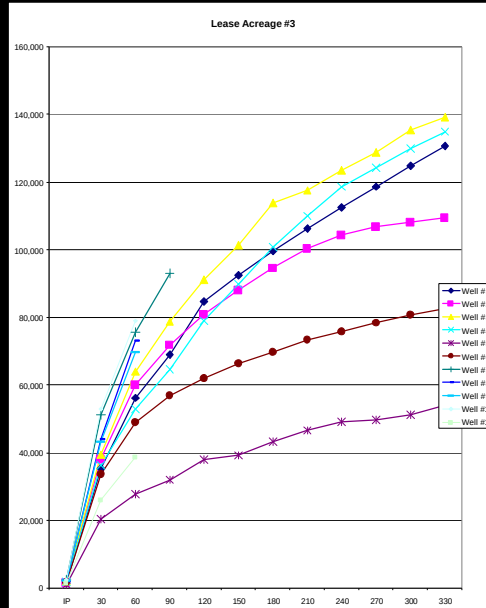
Lease Acreage #3



Lease Acreage #3



Lease Acreage #3



Results and Conclusions

- Maintain Consistency with Fracturing Variables in order to make informed decisions
- Sub fields within the Buffalo Wallow have dramatically varying production mechanisms and rates
- Increased volume of sand per foot of net pay indicates slight production benefit
- Increased volume of fluid per foot of net pay indicates slight production benefit
- Increased # of perforations indicate slight production benefit

Thank You

The Authors would like to thank the management of

Forest Oil Corporation
And
Halliburton Energy Services