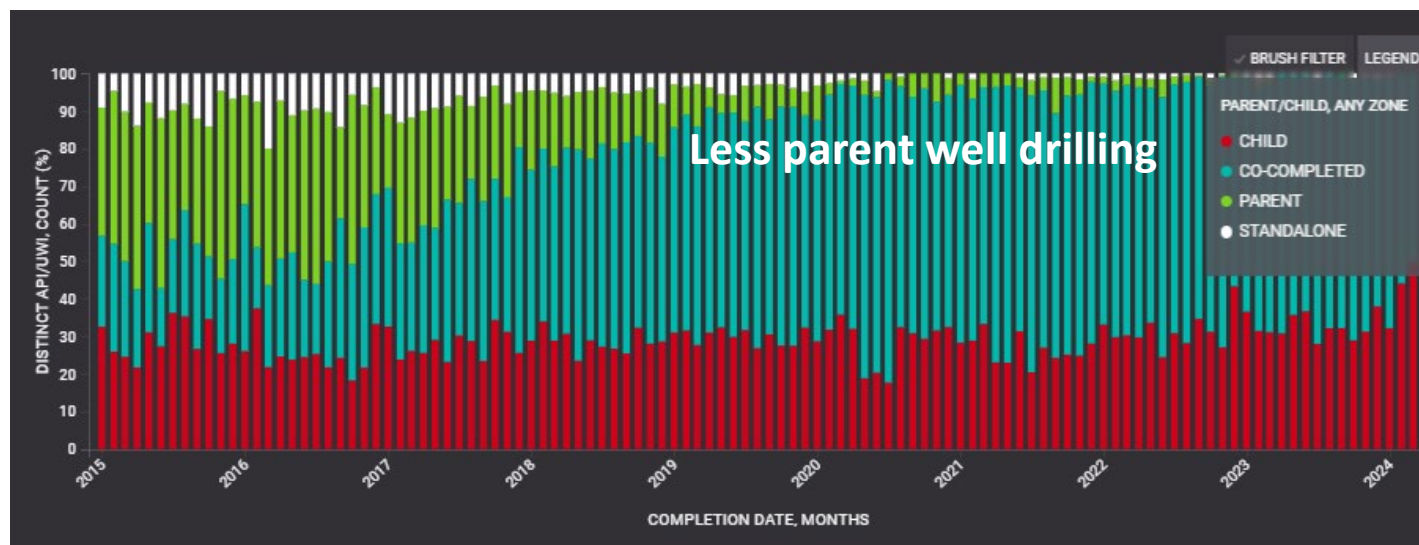
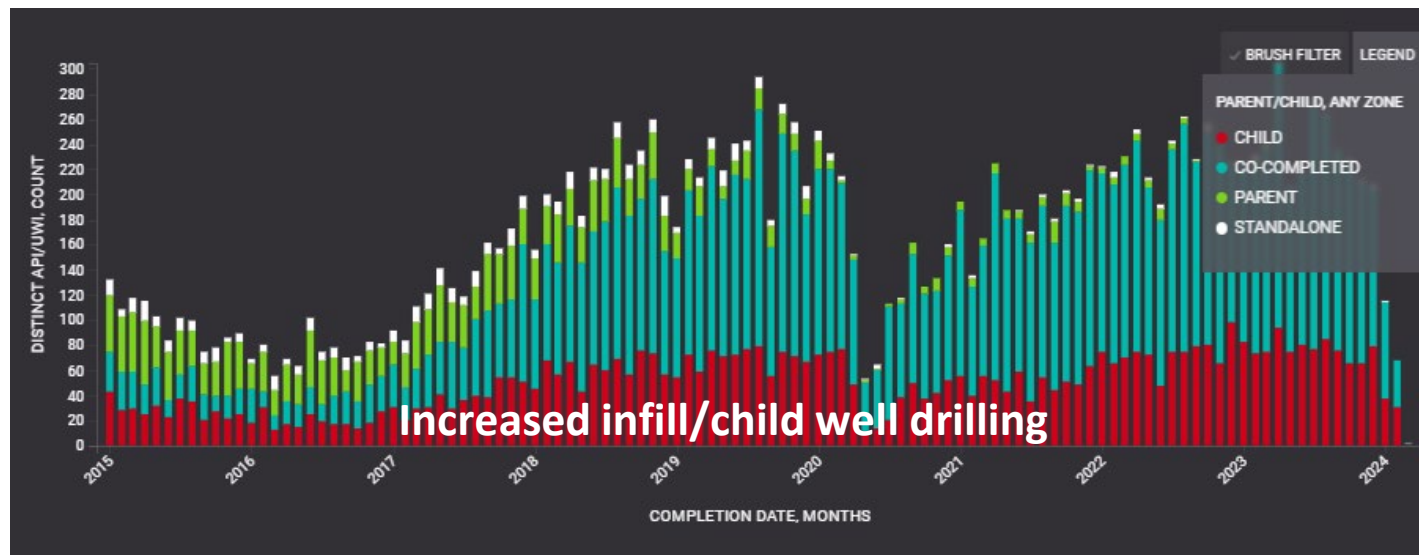
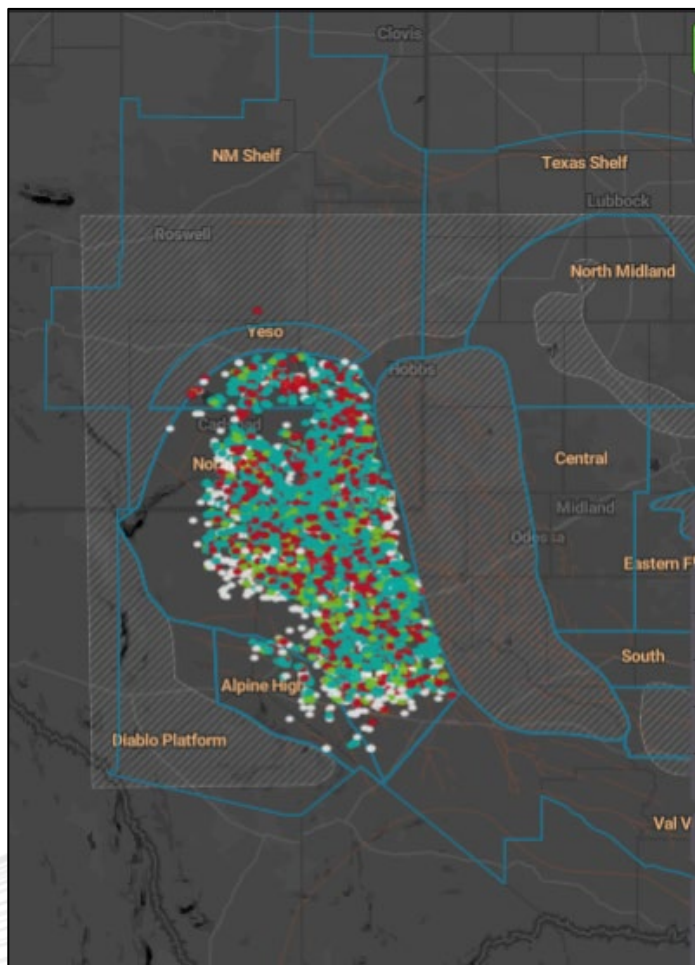




Infill Well Completion Technologies Mitigates Fracture Driven Interactions in Unconventional Reservoirs.

Foluke Ajisafe, Senior Staff Engineer | October 16, 2024

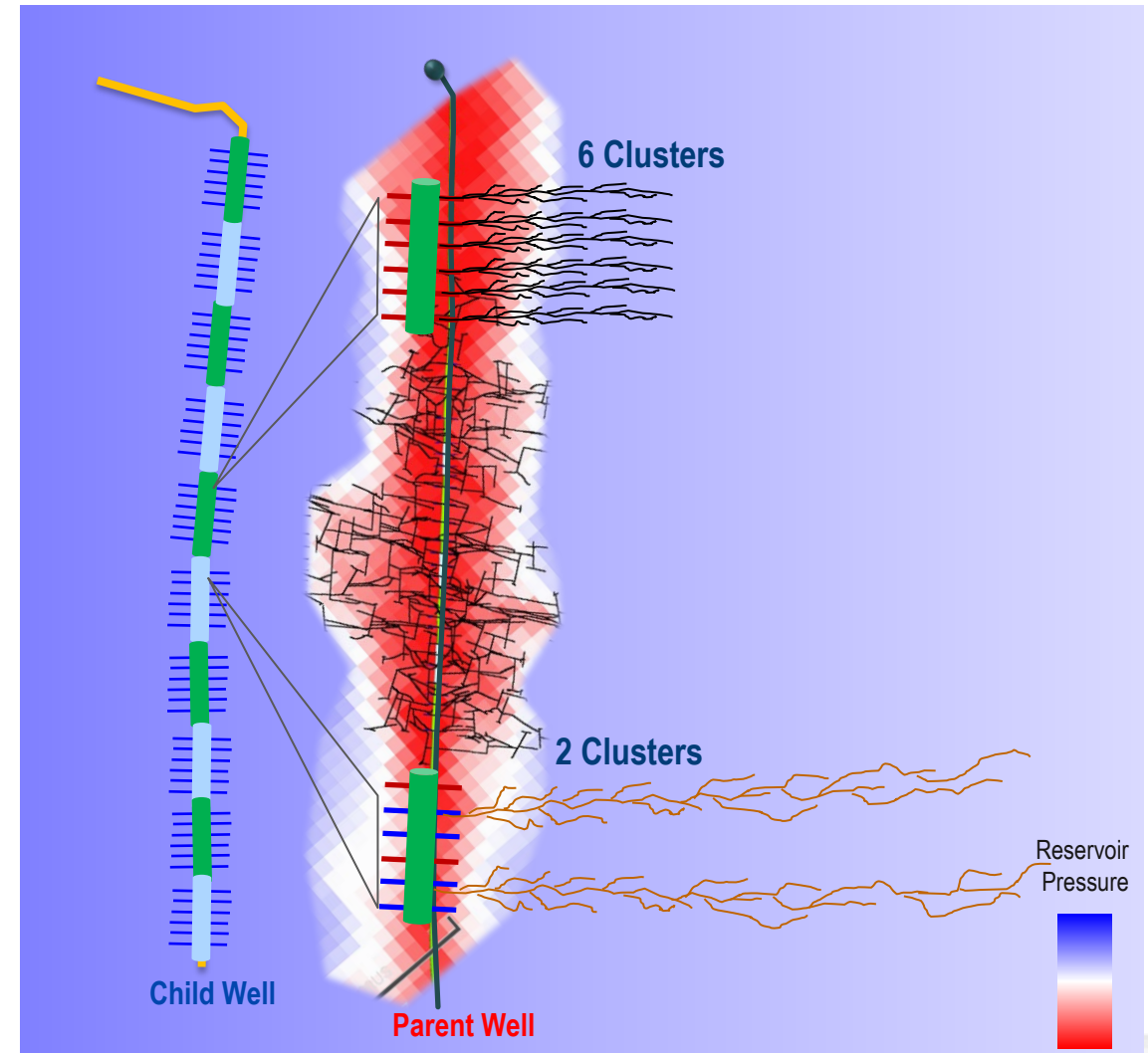
PARENT/CHILD WELL CHALLENGES



FDI (FRACTURE HIT) MITIGATION

OBJECTIVE

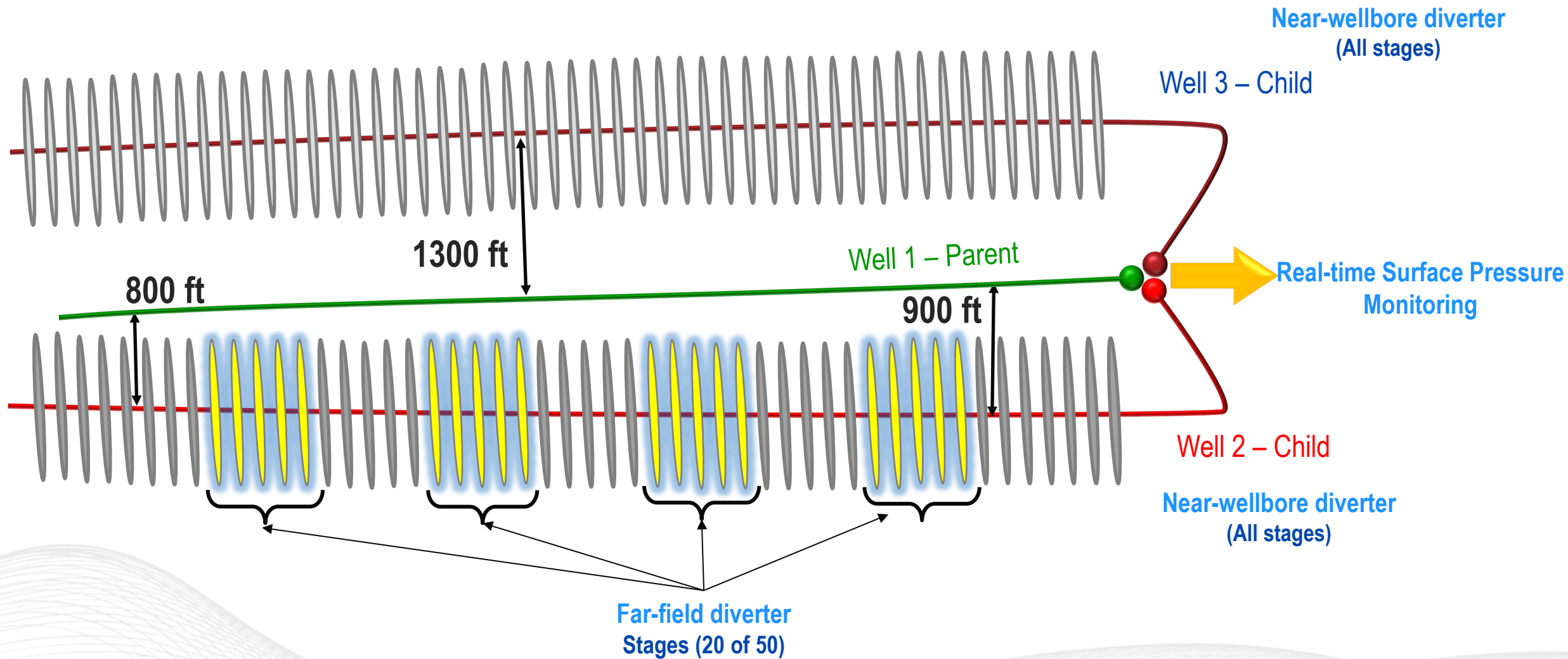
- Mitigate frac hits to parent wells
- Prevent wellbore sanding in parent wells
- Maintain parent well production post stimulation of child wells



TECHNOLOGY: VALUE-ADDED SOLUTIONS

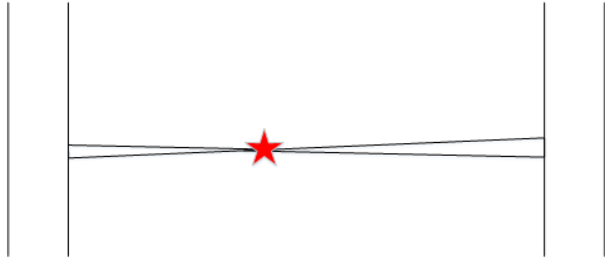
CHALLENGES	SOLUTIONS	VALUE
<p>1 DESIGN OPTIMIZATION</p>	 <p>Job Design Optimization</p>  <p>Real-Time Monitoring</p>	<p>Production protection and workover mitigation</p> <p>Real-time frac hit identification</p>
<p>2 CLUSTER EFFICIENCY</p>	 <p>Near-Wellbore Diversion</p>	<p>Improve cluster efficiency</p>
<p>3 FRACTURE DRIVEN INTERACTION</p>	 <p>Far-Field Diversion</p>	<p>Reduce frac hits</p>

MIDDLE BAKKEN EXAMPLE-DUNN COUNTY

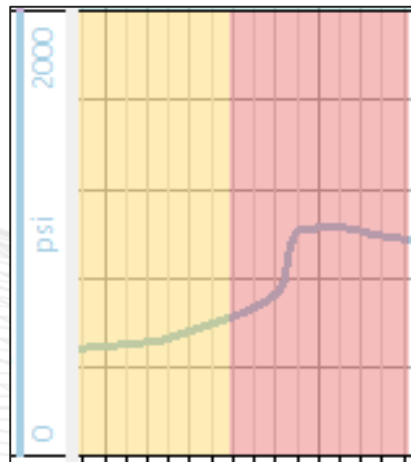


OFFSET PARENT WELL DIAGNOSTICS

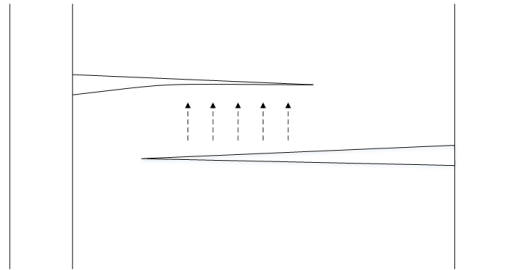
Frac Hit



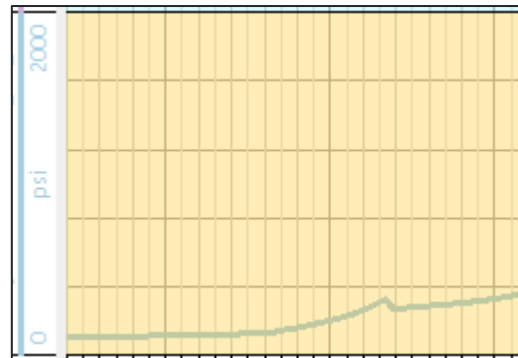
- > 250 psi for 30 min
or
- > 5 psi/min



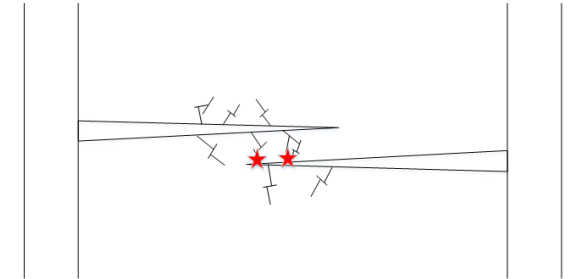
Poroelastic



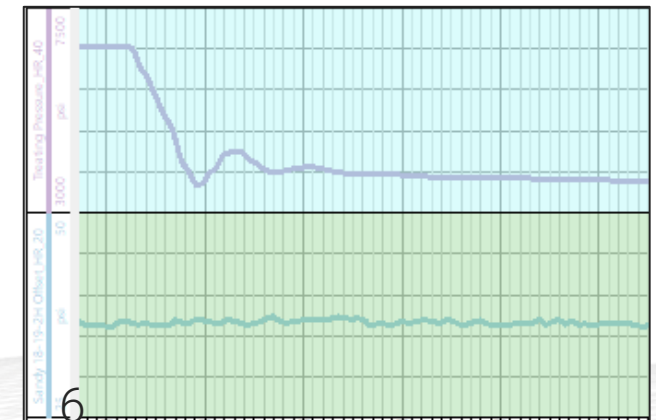
- > 60 psi for stage
and
- > 3 psi/min



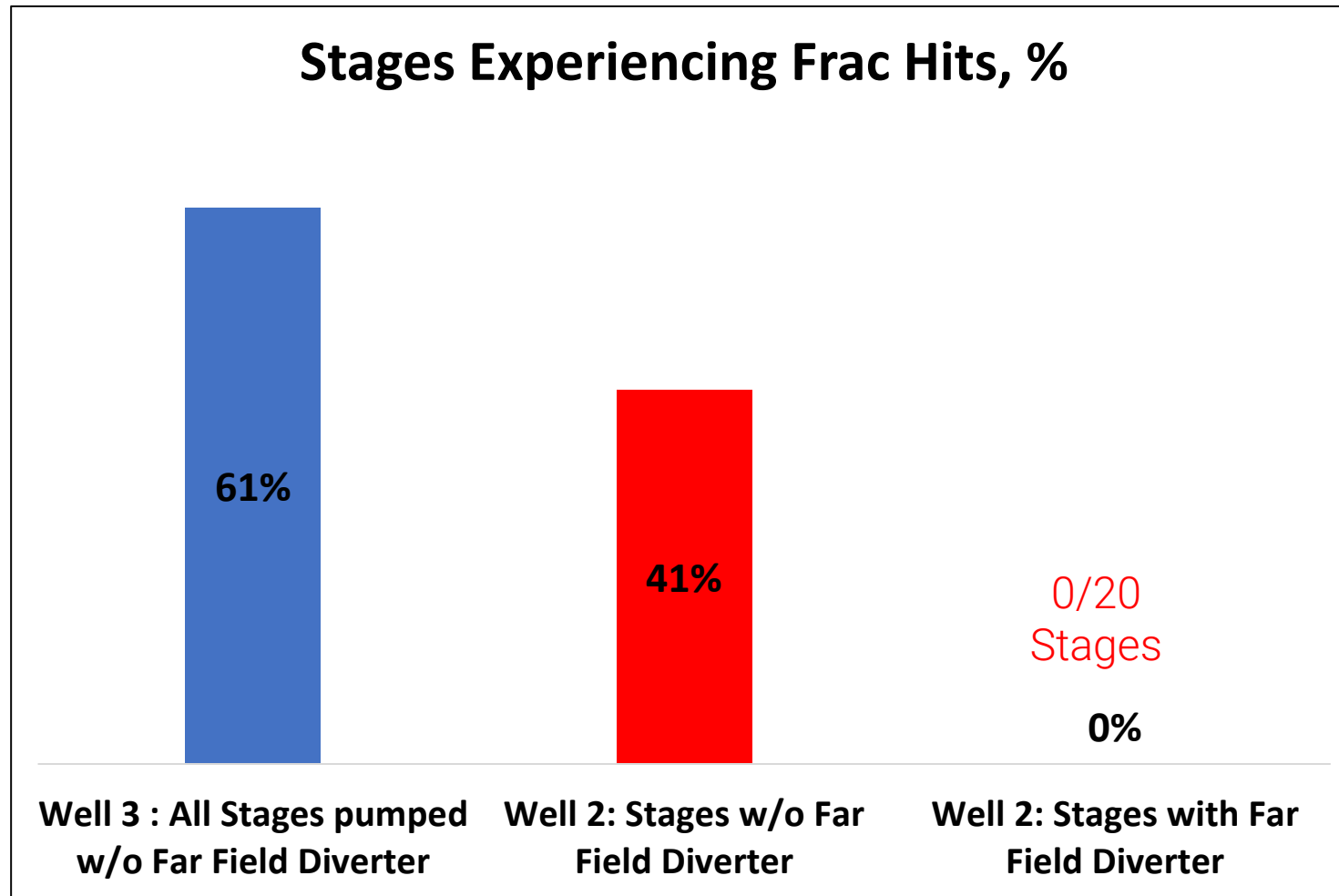
Weak Communication



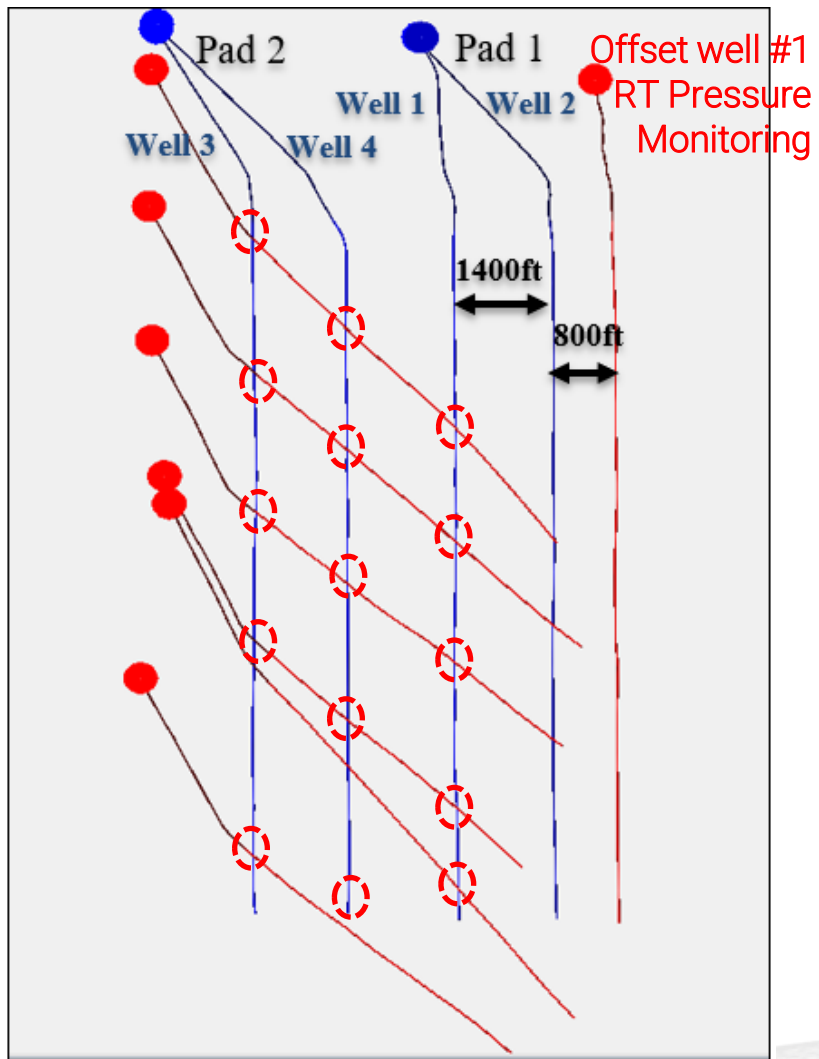
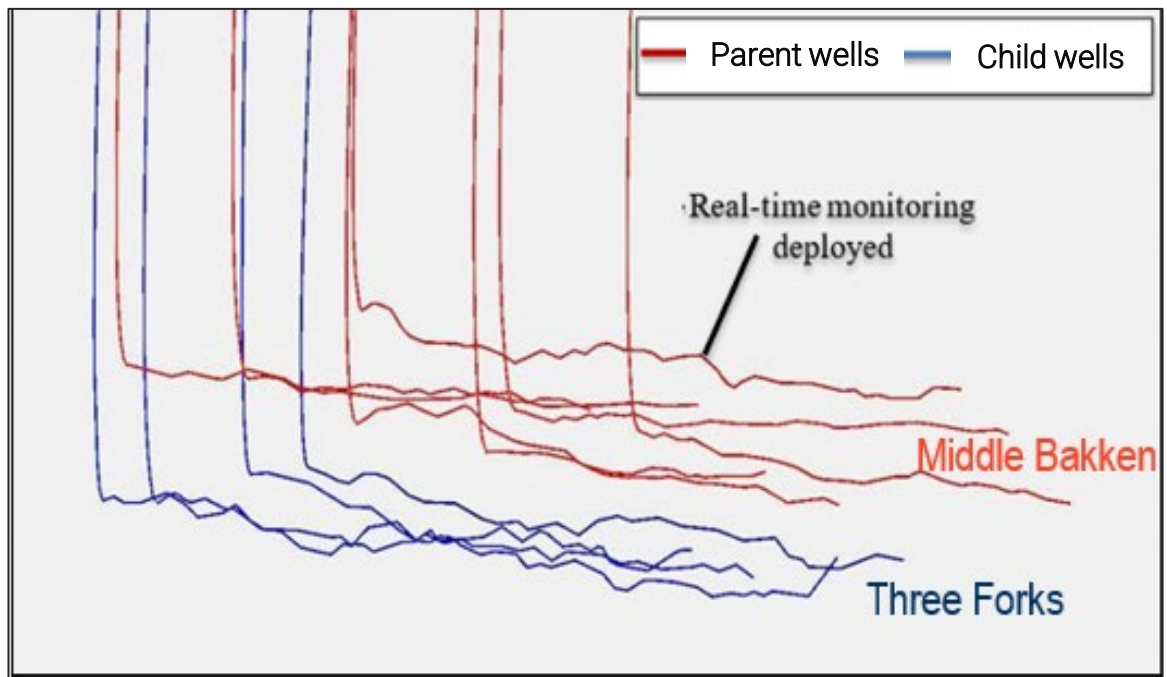
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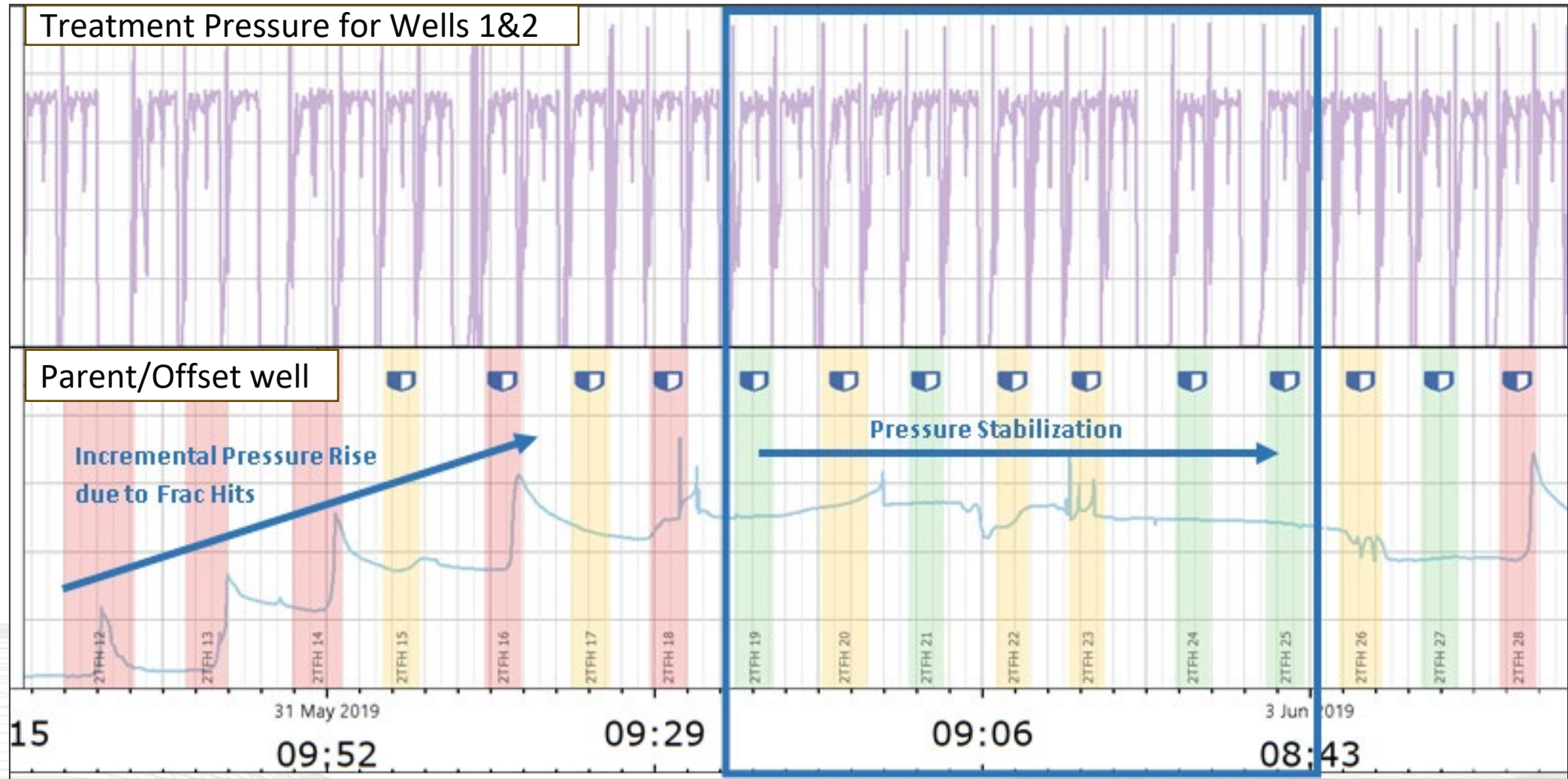
MIDDLE BAKKEN RESULTS-DUNN COUNTY



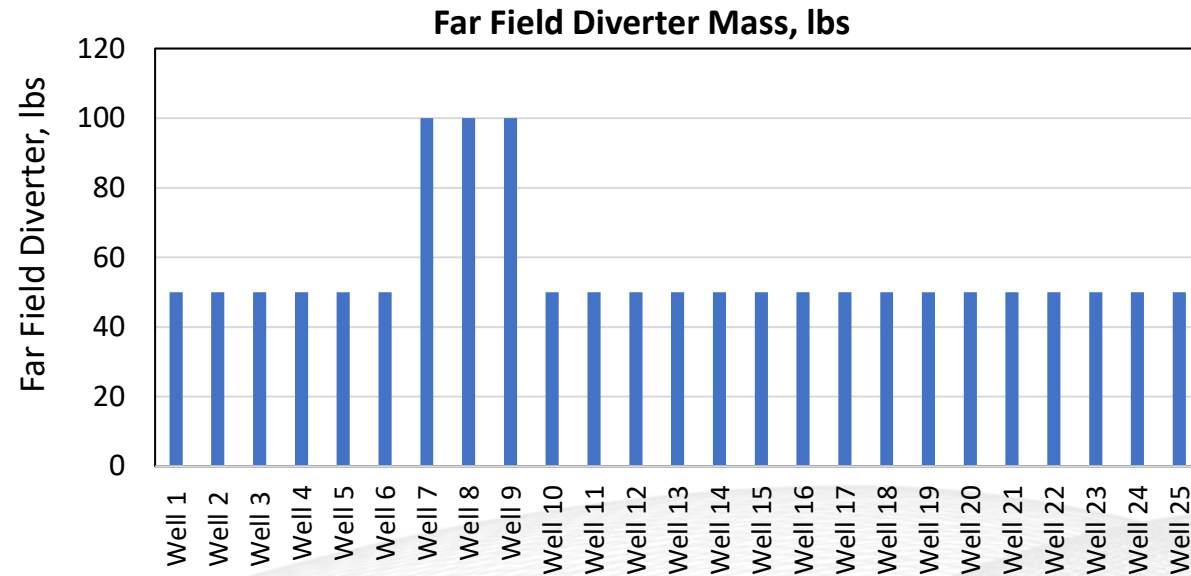
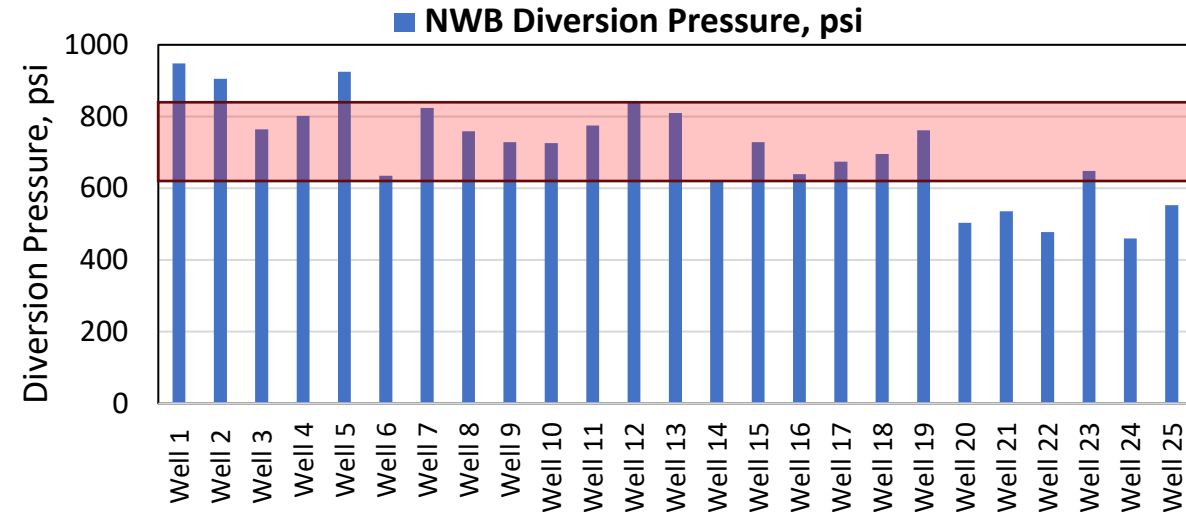
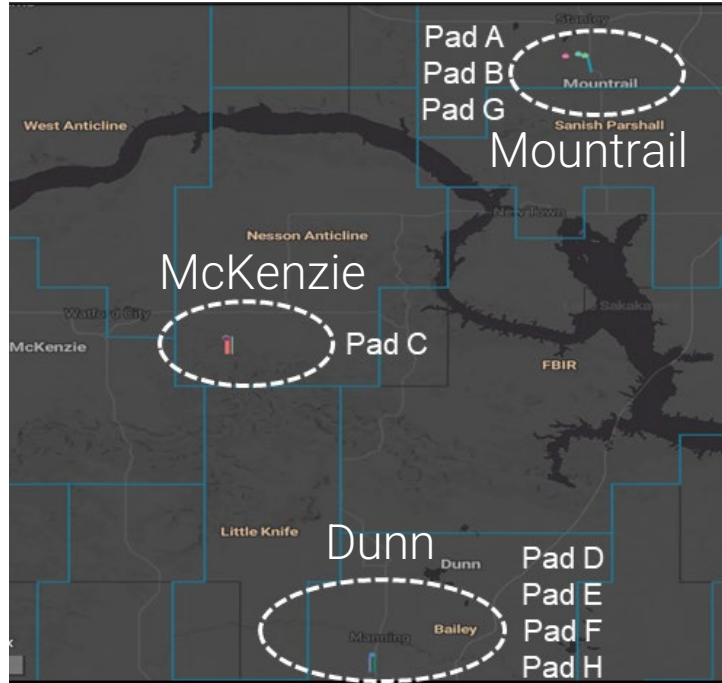
RT INFILL WELL OPTIMIZATION-DUNN COUNTY



RT INFILL WELL OPTIMIZATION-DUNN COUNTY



FULL IMPLEMENTATION-STUDY AREA

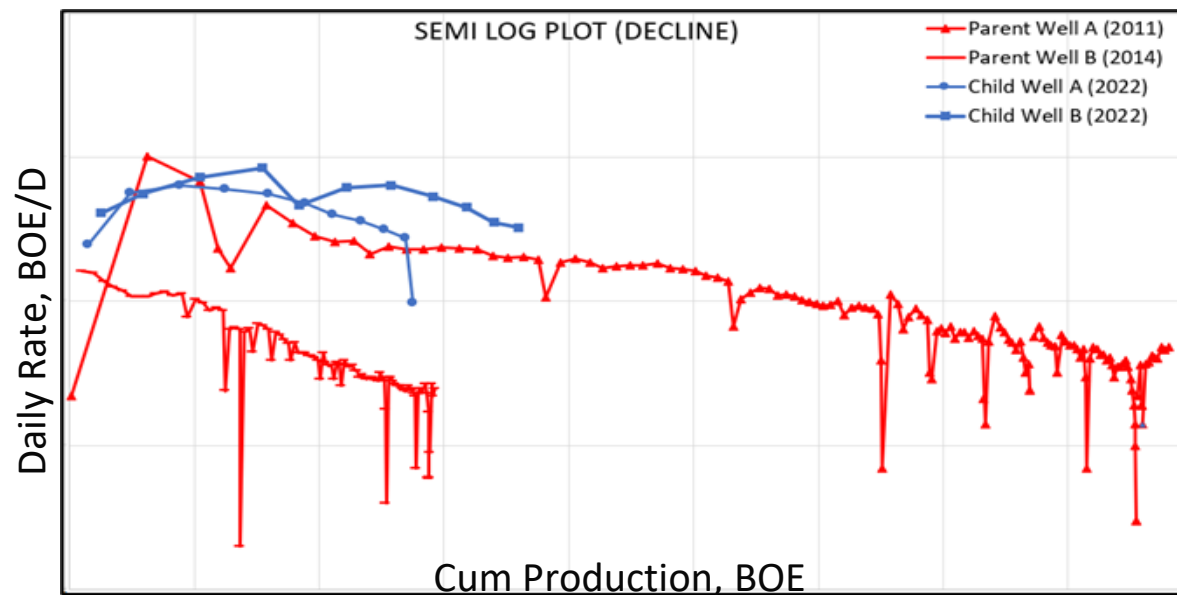
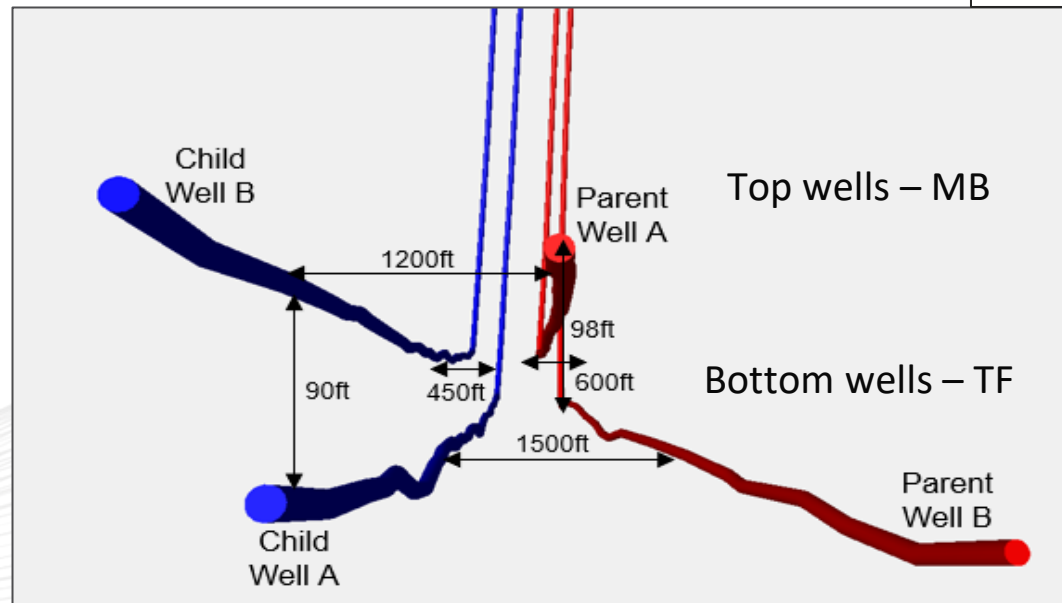
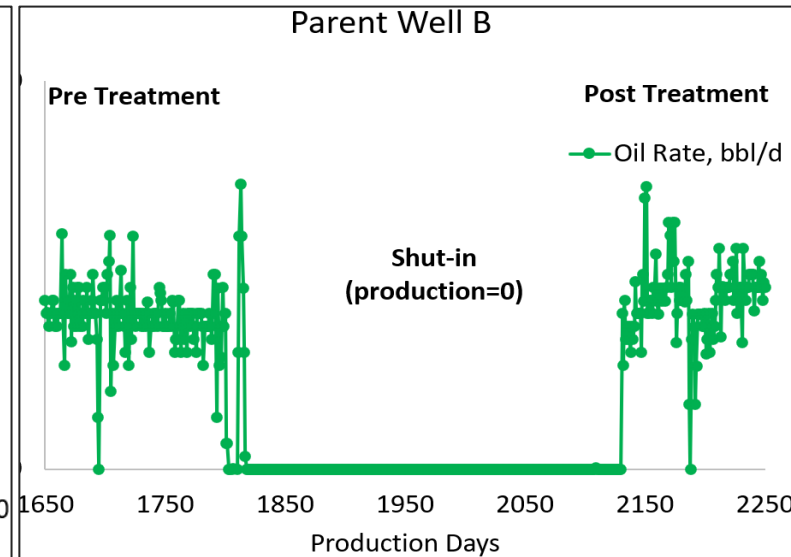
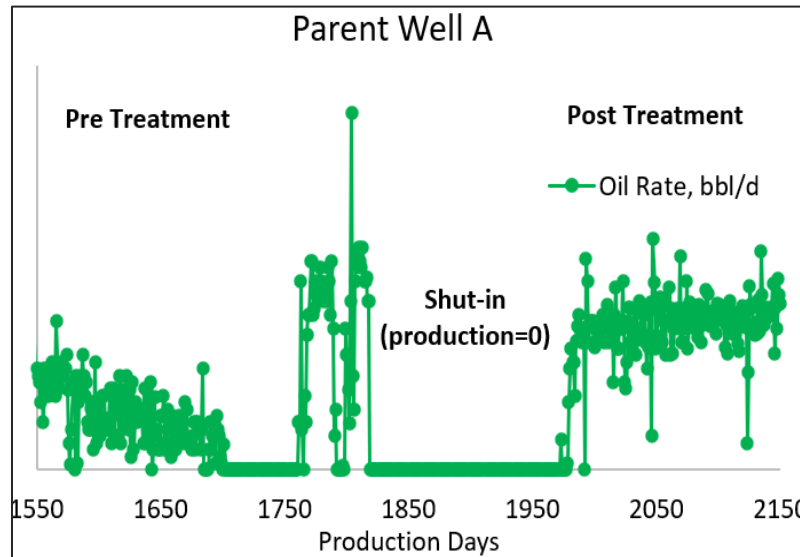


PAD A-PRODUCTION GAIN

- Production uplift observed in parent wells
- Good child well production performance

Key Takeaway

- Complete Middle Bakken (MB) and Three Fork (TF) wells at the same time to optimize production



PAD B-PRODUCTION GAIN

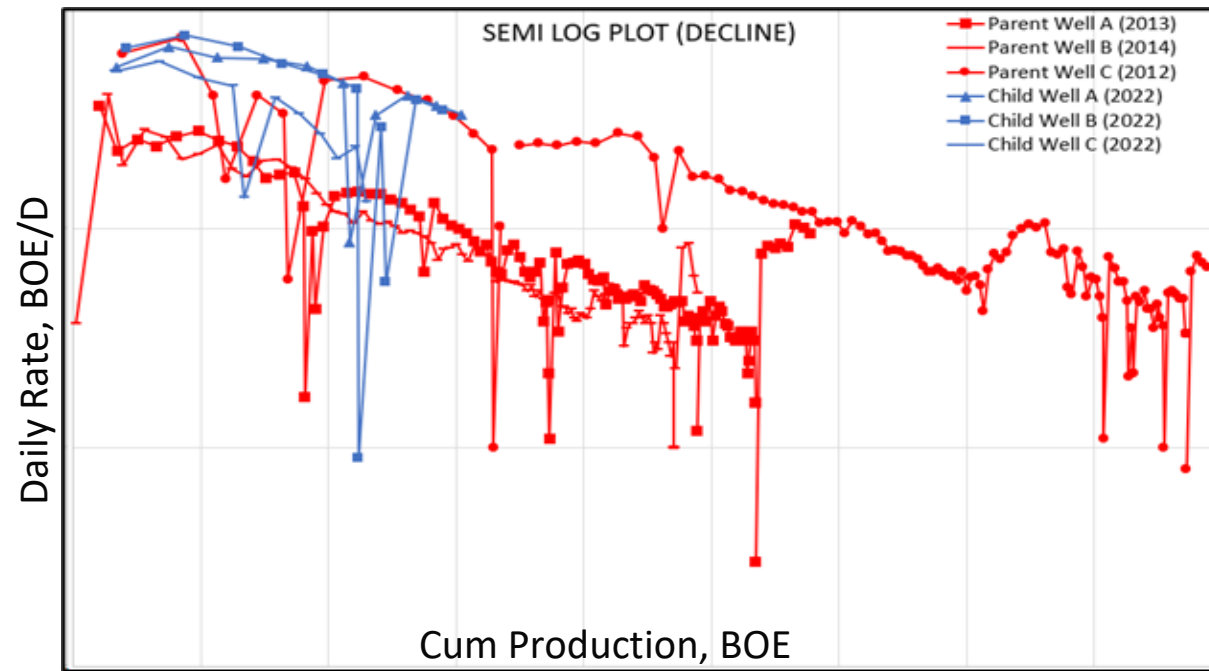
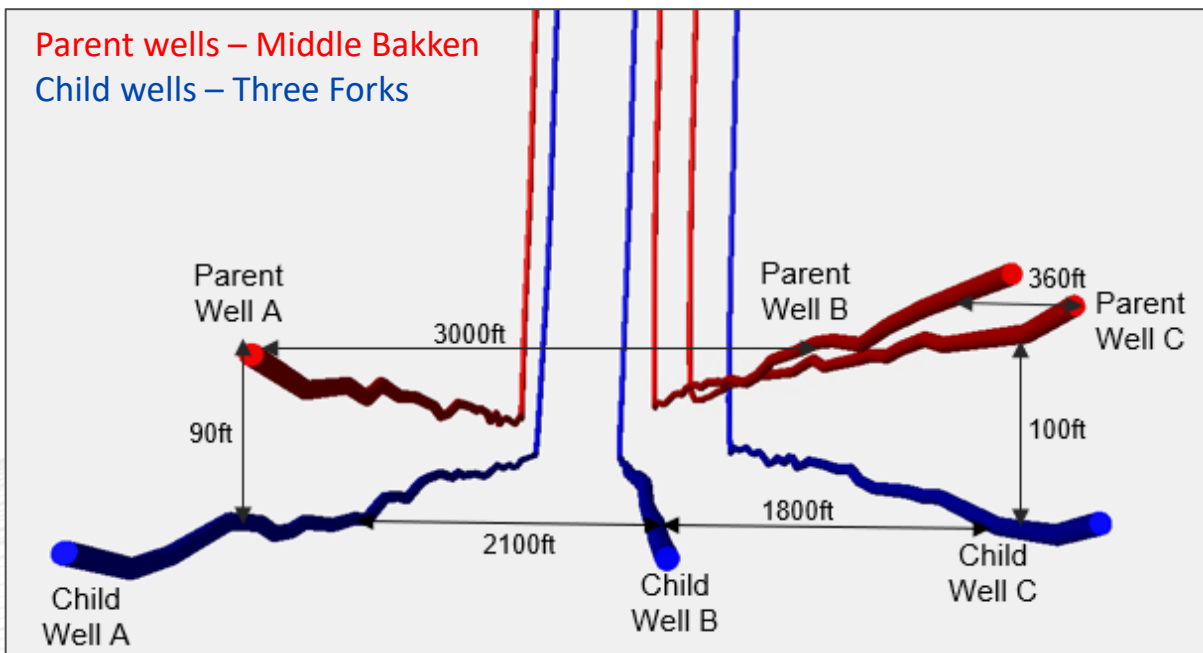
- Production uplift observed in parent wells
- Good child well production performance

Key Takeaway

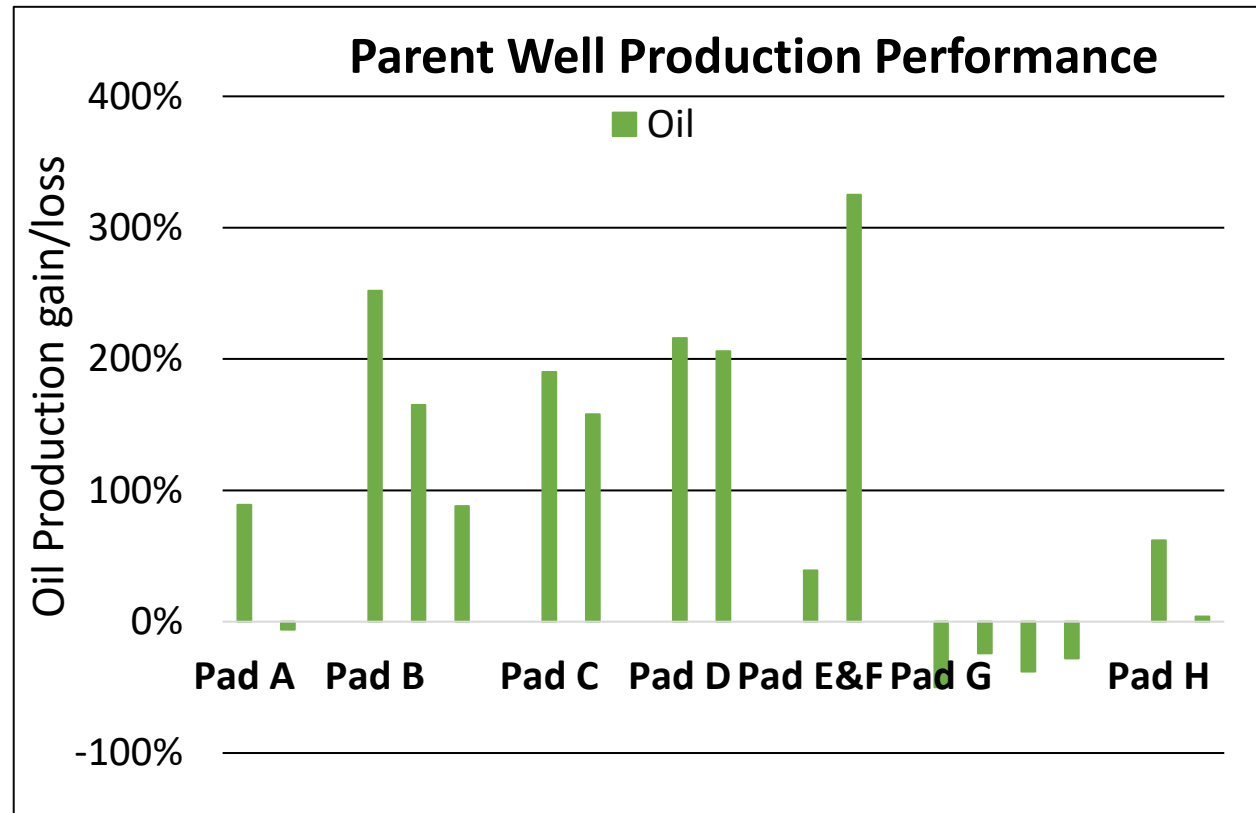
- Influence of depletion and well spacing observed in production performance.

Production Change

Parent Wells	Oil
Parent Well A	+252%
Parent Well B	+165%
Parent Well C	+88%



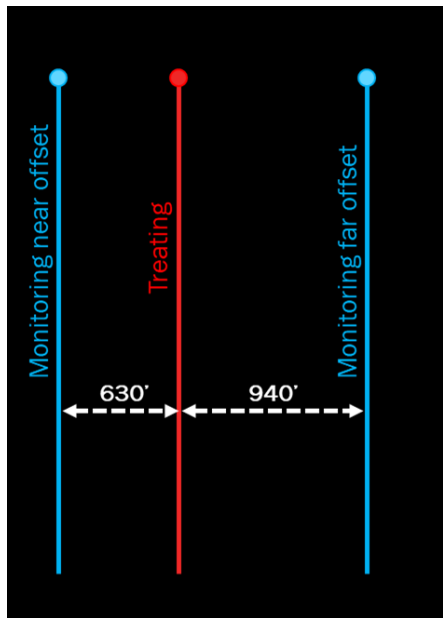
SUMMARY



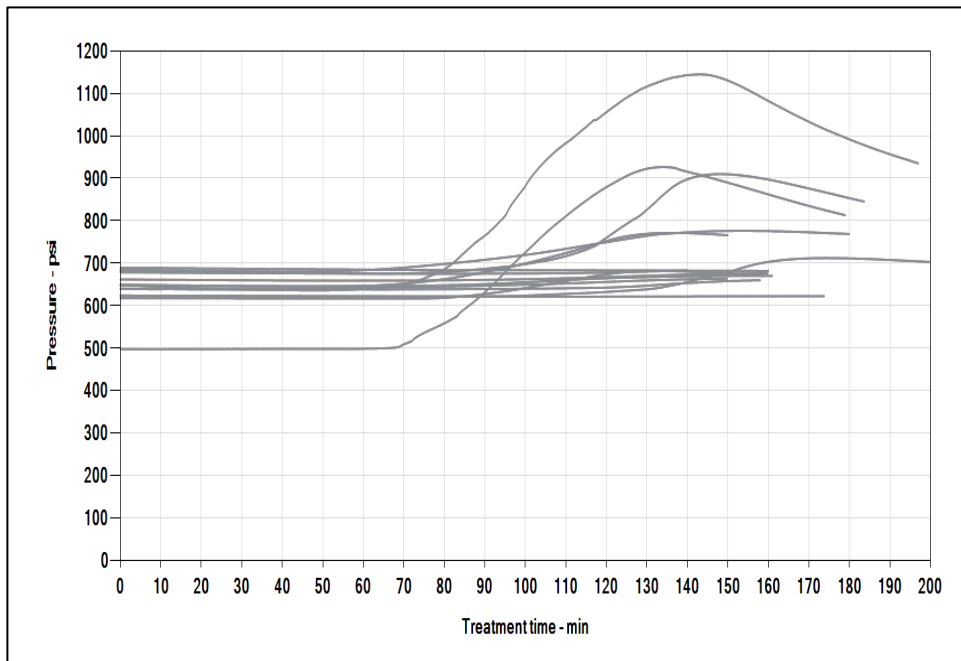
- Overall ~ 75% of parent wells show uplift in oil production.
- 80% of child wells show comparable well performance with parent wells.
- Fewer parent wellbore cleanout performed in Dunn and McKenzie counties.

PERMIAN EXAMPLE

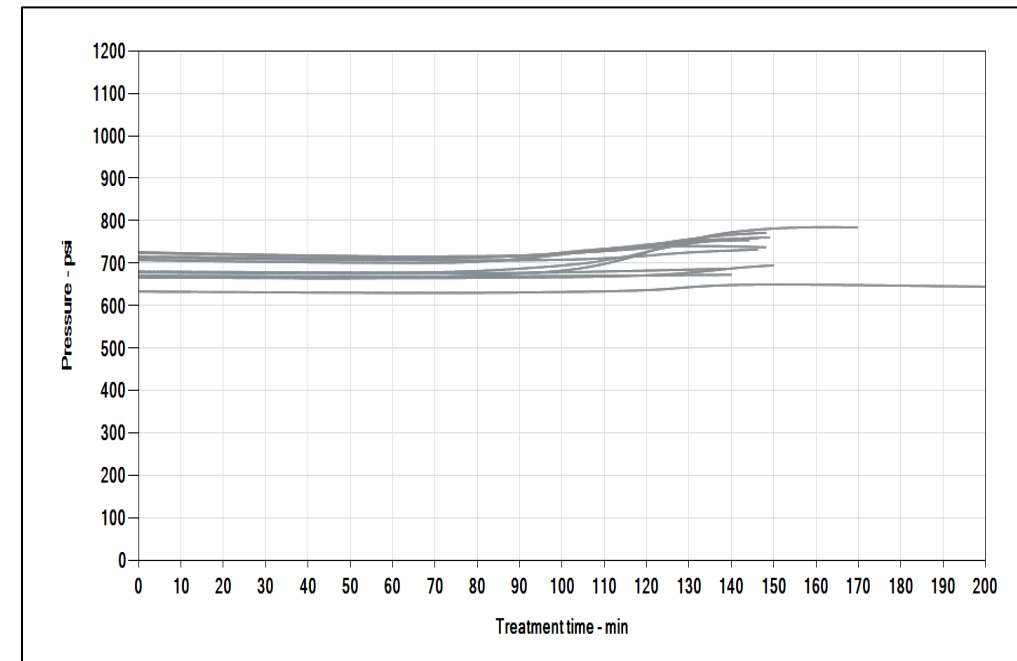
STAGE LEVEL SUMMARY NEAR OFFSET



Stages with no Far Field Diverter

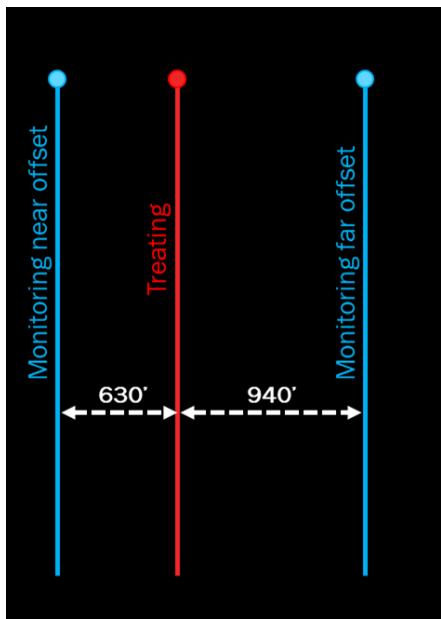


Stages with Far Field Diverter

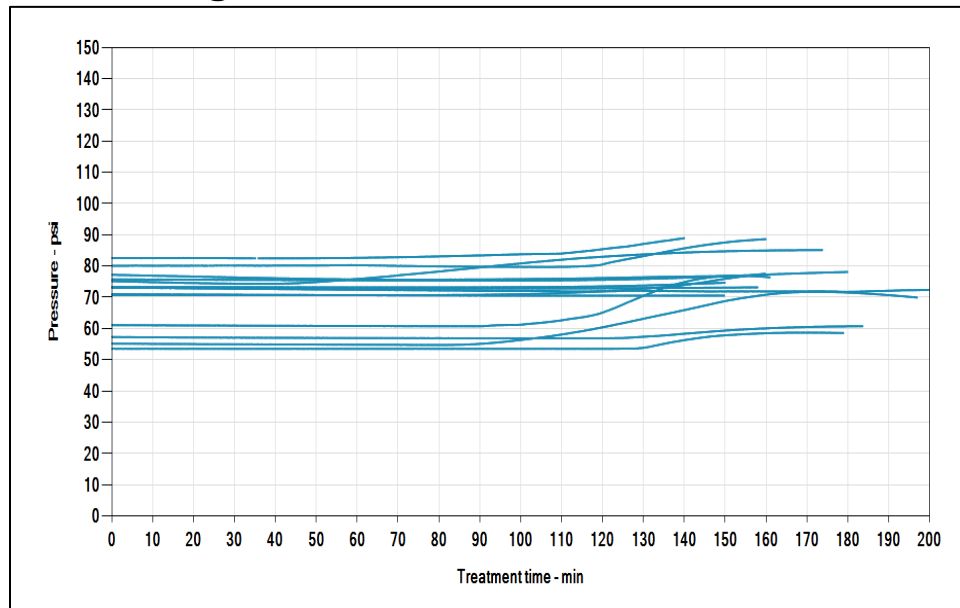


- For the near offset well, stages pumped with no FFD show a wider range of pressure response with pressure change up to 500 psi, as compared to stages with FFD with maximum pressure change around 100 psi.

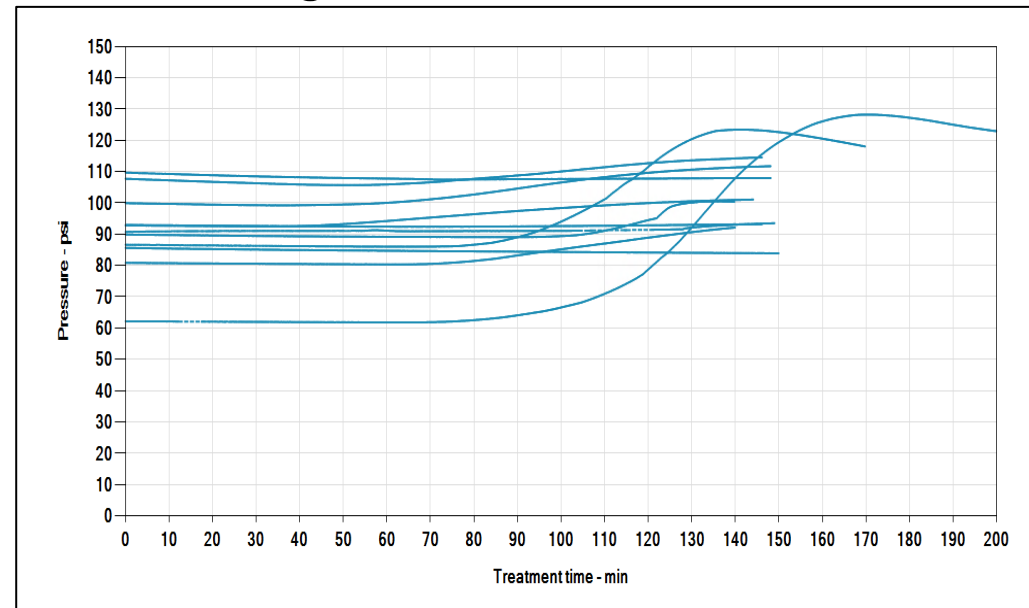
PERMIAN EXAMPLE STAGE LEVEL SUMMARY FAR OFFSET



Stages with no Far Field Diverter



Stages with Far Field Diverter



- For the far offset well, pressure responses are lower in magnitude when compared to the near offset well.
- Overall, stages pumped with FFD show a wider range of pressure response both in number and in magnitude as compared to stages with no FFD, also evident of frac symmetry.

CONCLUSION

Bakken

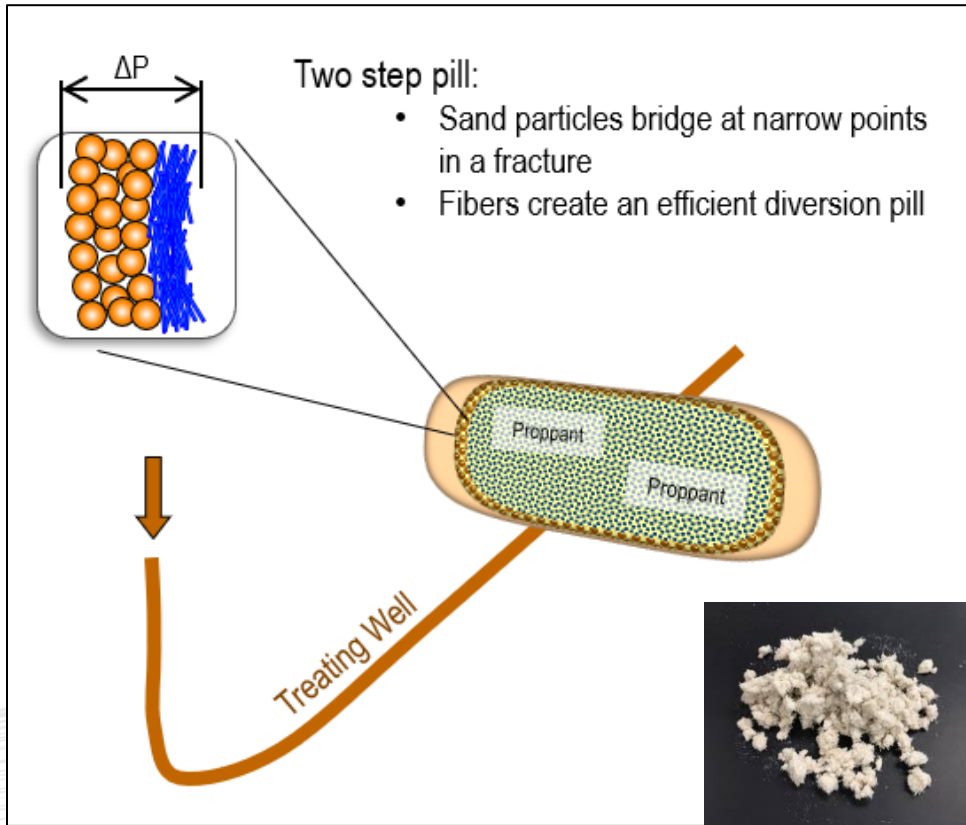
- Optimizing far-field diverter design and real-time pressure monitoring will help mitigate more severe fracture driven communication (frac hits).
- Fewer parent wellbore cleanouts were performed in Dunn and McKenzie counties compared to Mountrail.
- Completing the Middle Bakken and Three Fork wells simultaneously resulted in improved production.

Permian

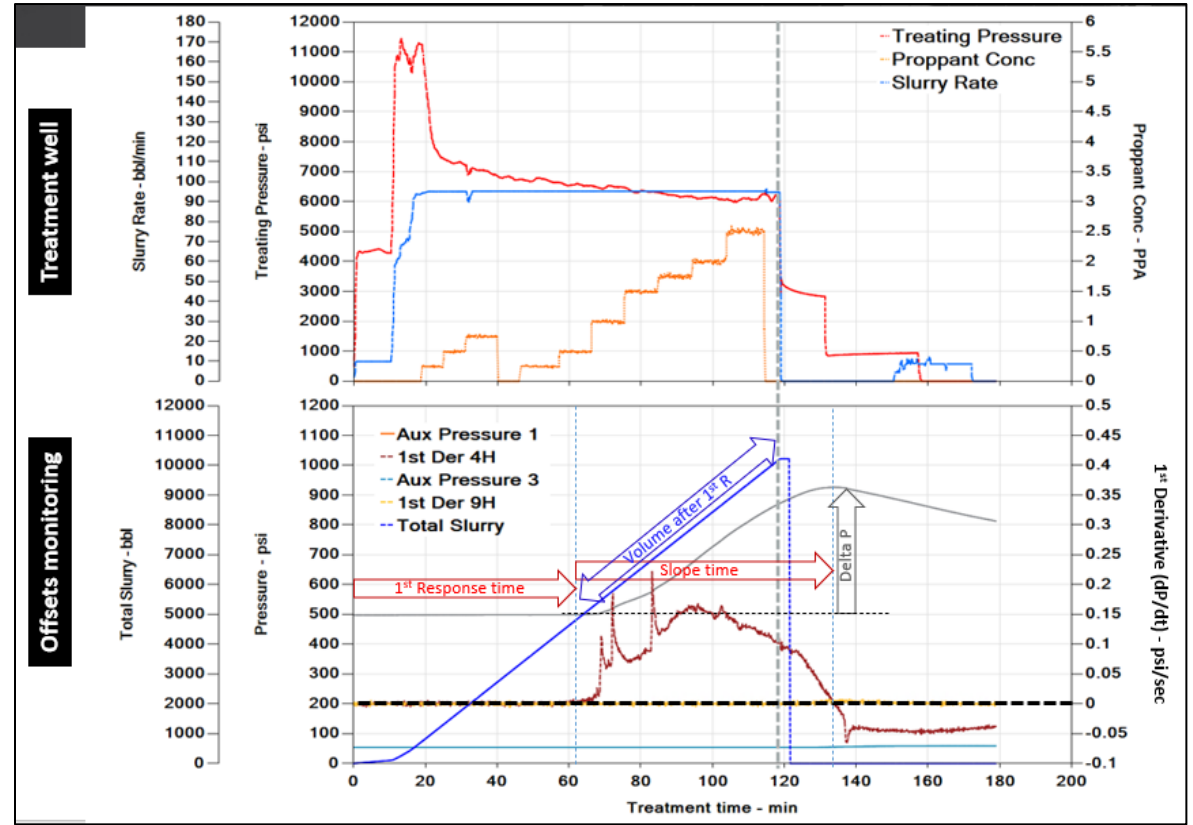
- Optimizing far-field diverter design and real-time pressure monitoring will help mitigate more severe fracture driven communication (frac hits).

WAY FORWARD

FAR FIELD DIVERTER PILL FORMULATION



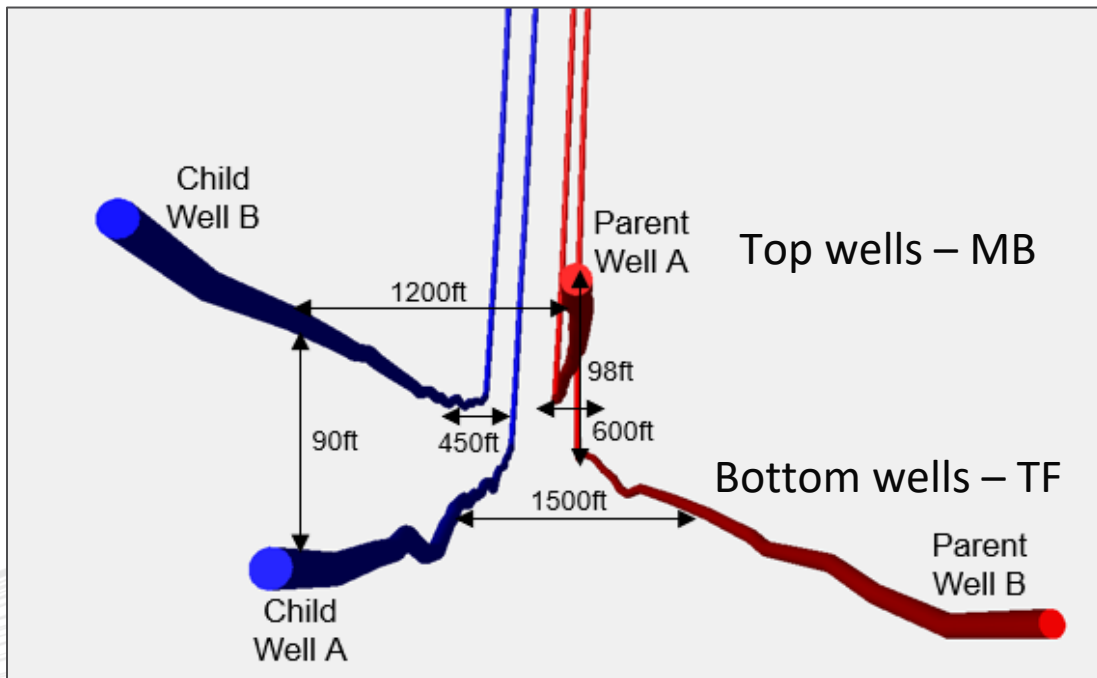
OFFSET WELL PRESSURE DIAGNOSTICS



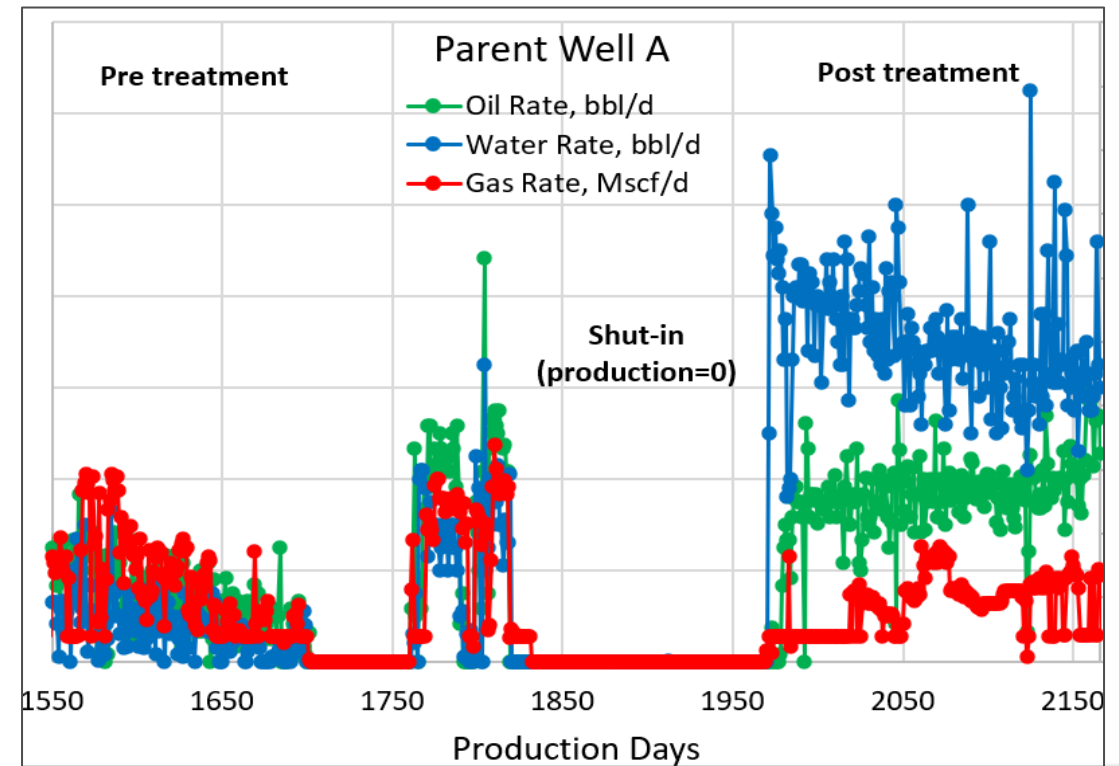
WAY FORWARD

Solution

Surfactants – change formation wettability to water wet to reduce water production.



Parent Wells	Oil	Gas	Water	Water Cut	Gas-oil Ratio
Parent Well A	+89%	-36%	+487%	+78%	-73%



ACKNOWLEDGEMENTS

Thanks to Lime Rock Resources and Liberty Energy for the permission to publish this work.



Thank You!
Q&A

