

North Dakota Petroleum Council Annual Meeting

Justin J Kringstad

Geological Engineer

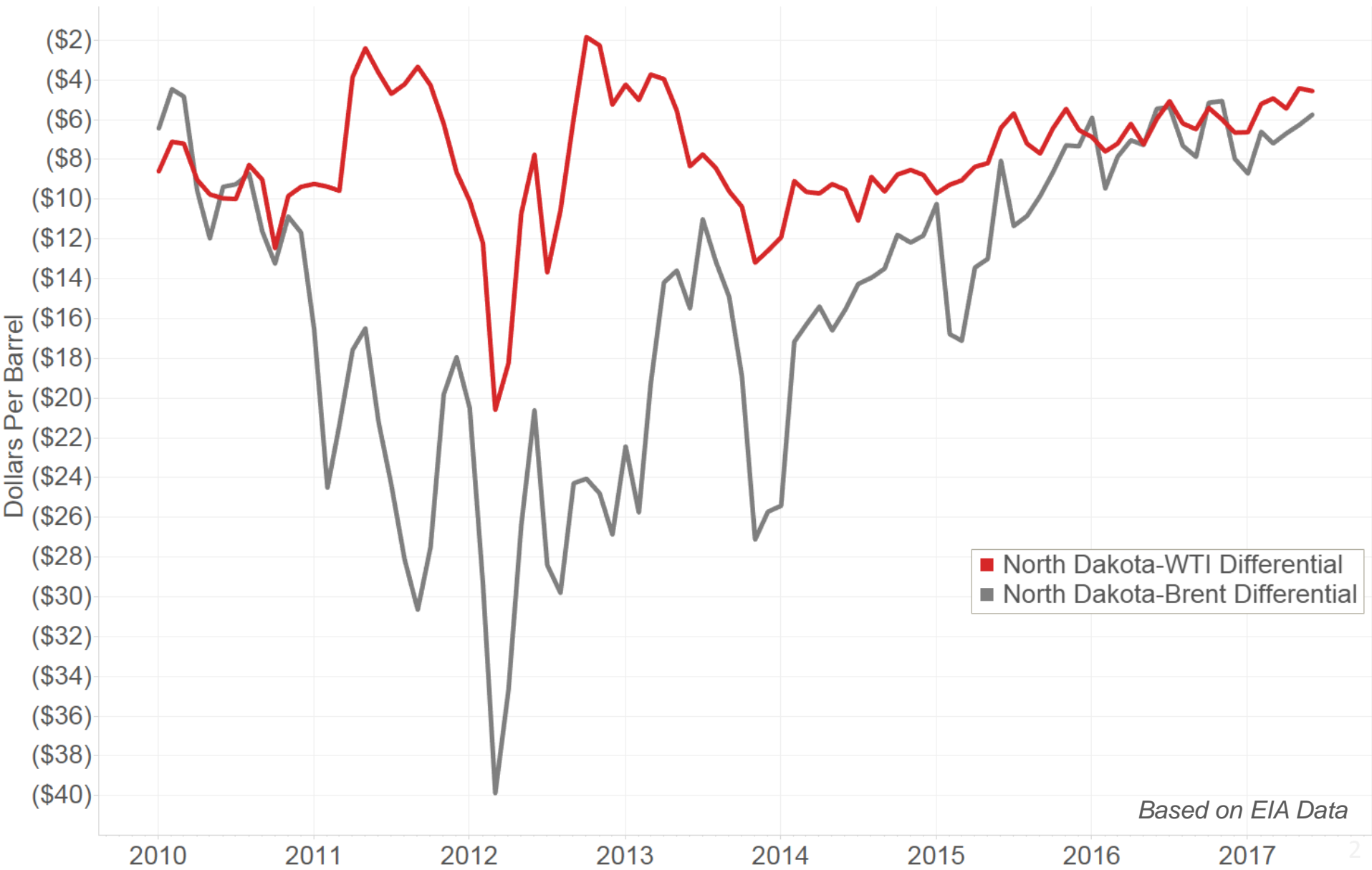
Director

North Dakota Pipeline Authority

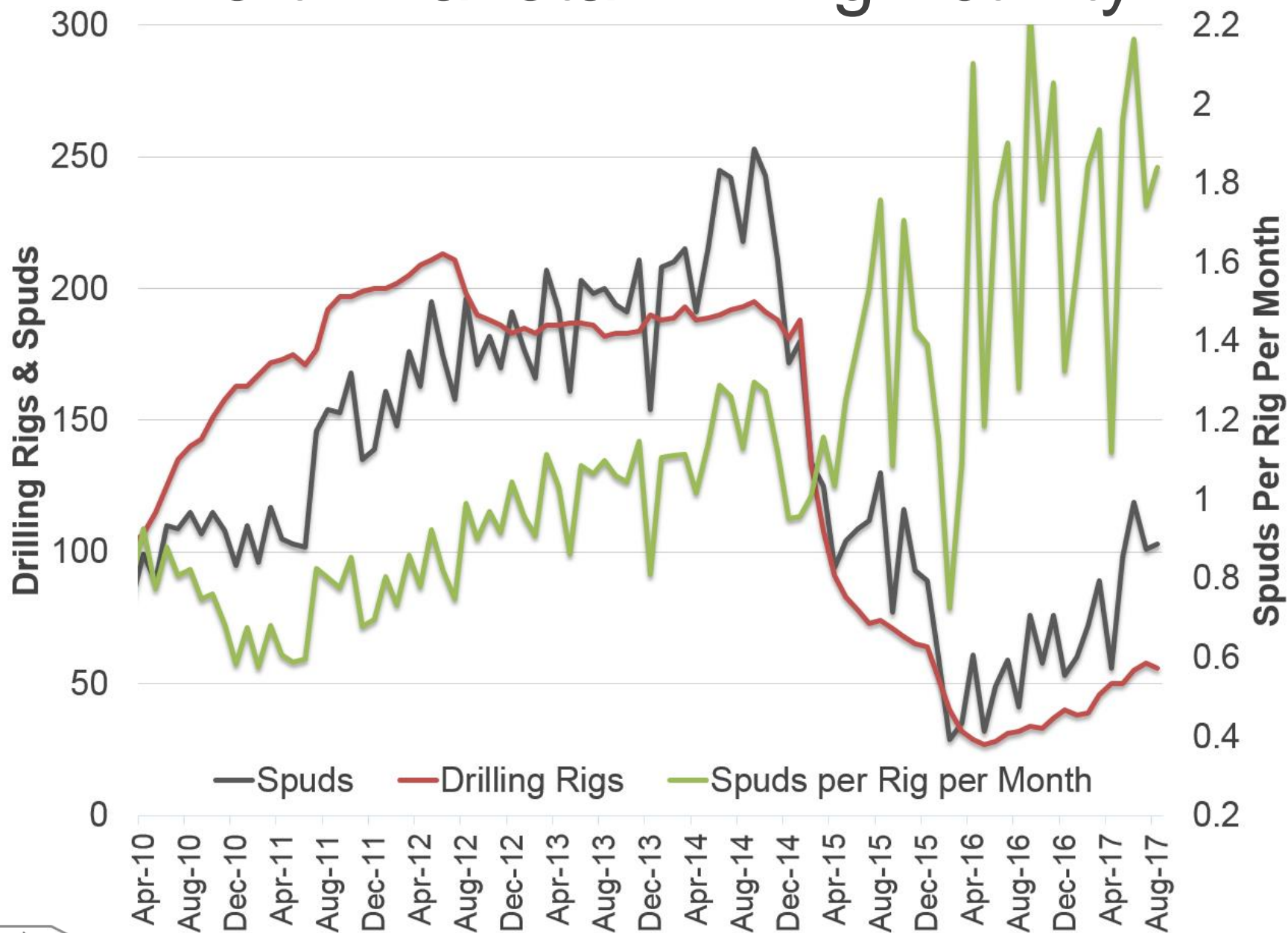


September 28, 2017

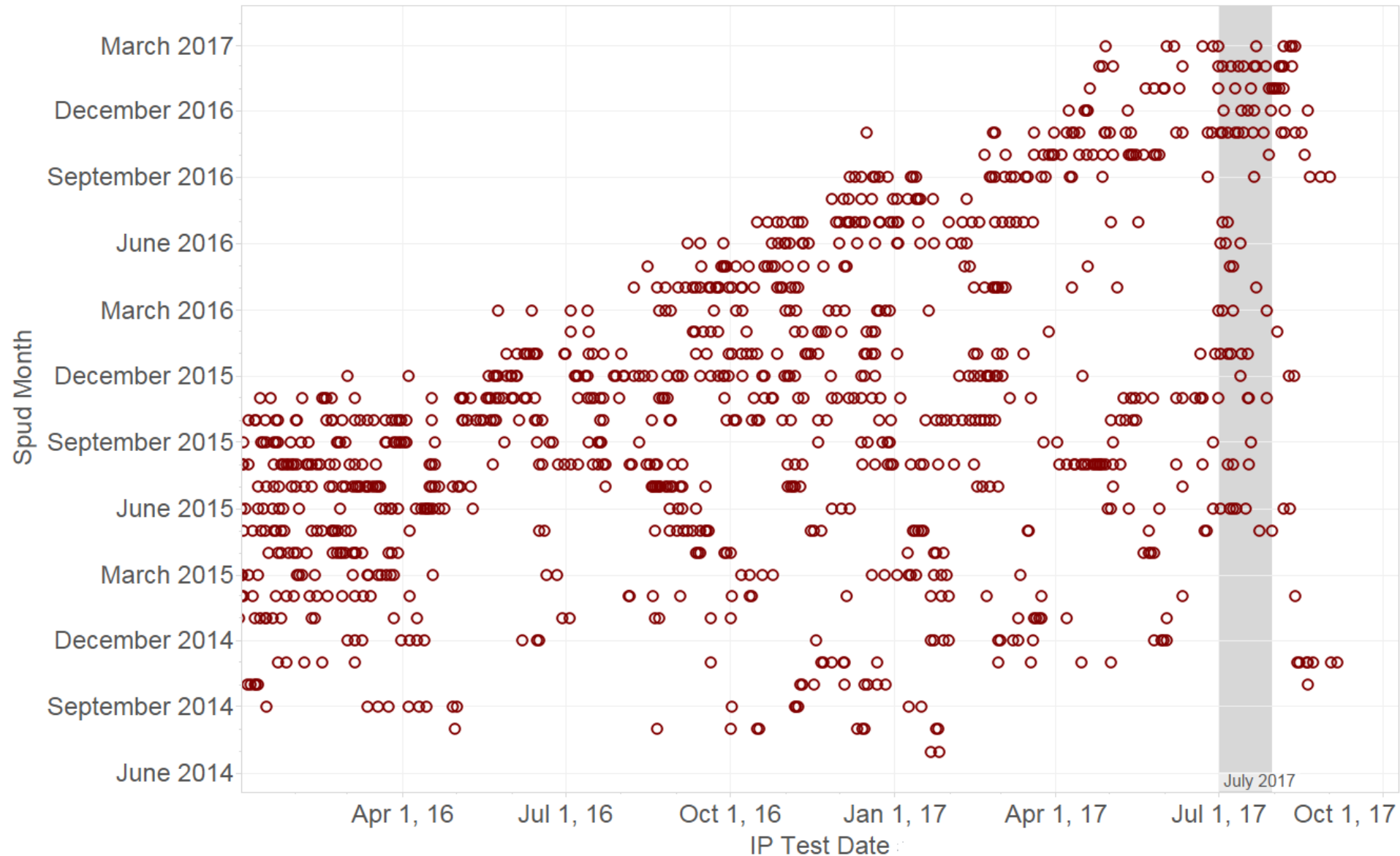
North Dakota Oil Differential



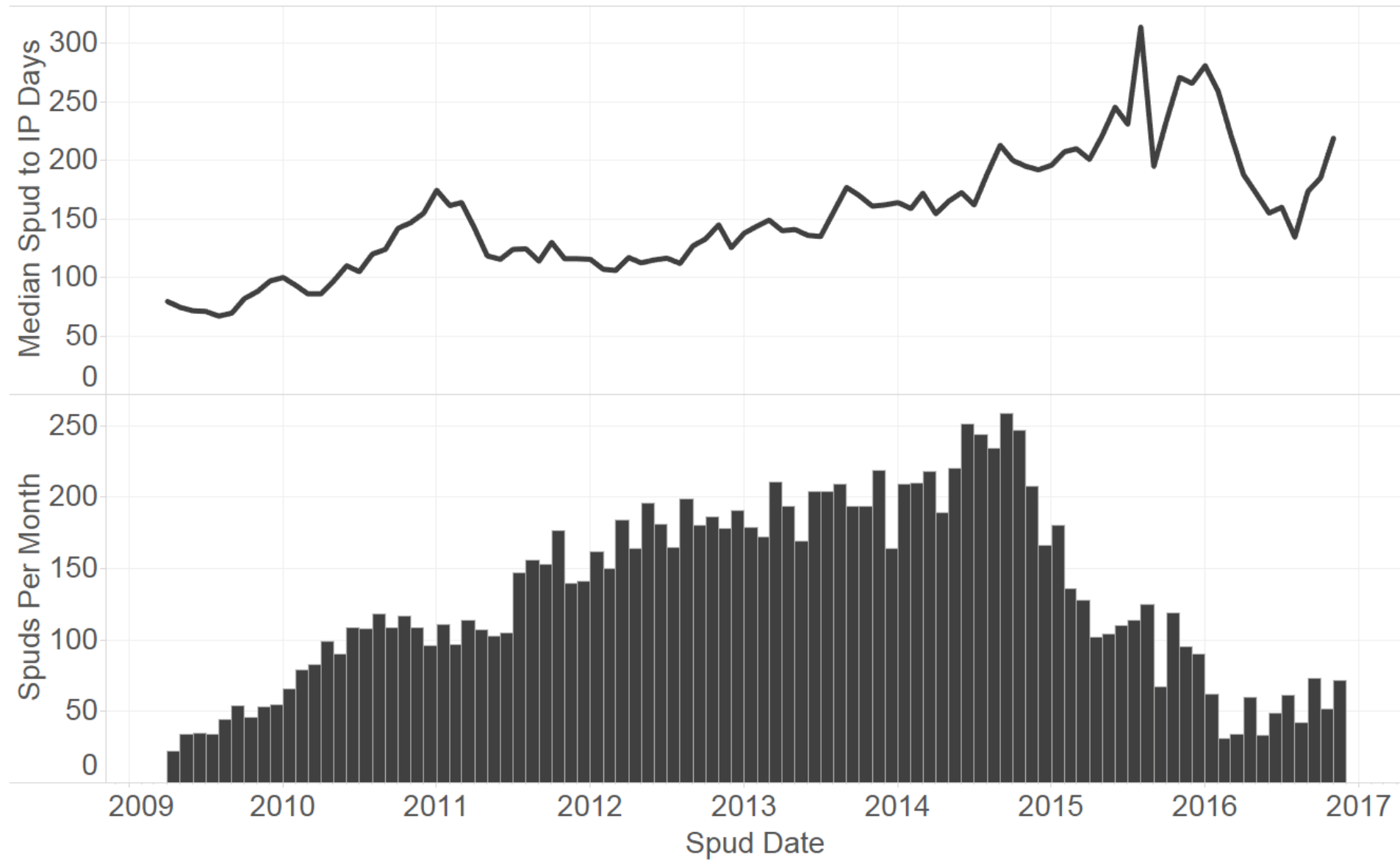
North Dakota Drilling Activity



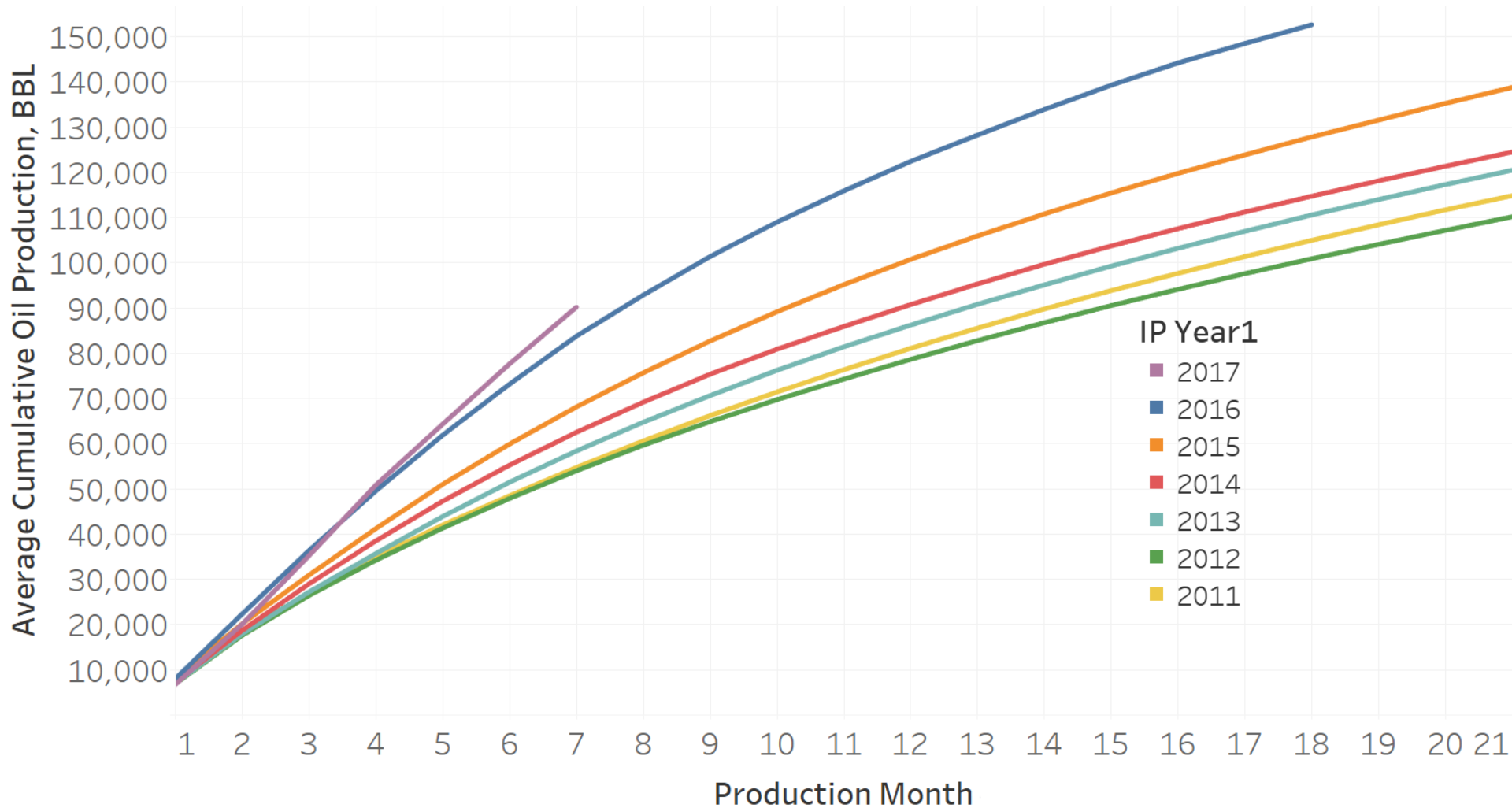
Continued Targeting of DUC Wells



North Dakota Spud to Initial Production



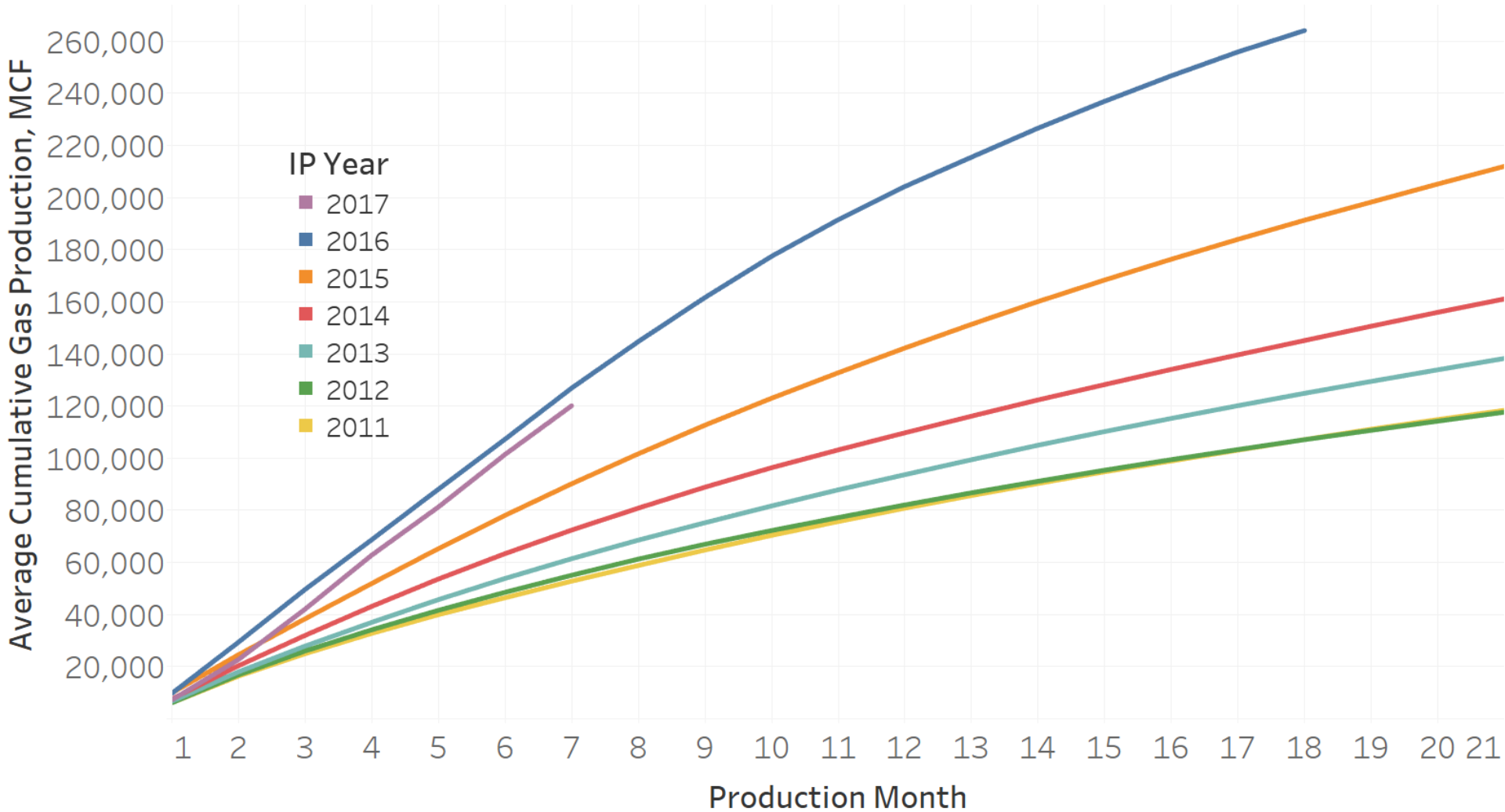
Statewide Oil Performance



Average BKN/TF Well Performance Statewide (Minimum 1 bopd)



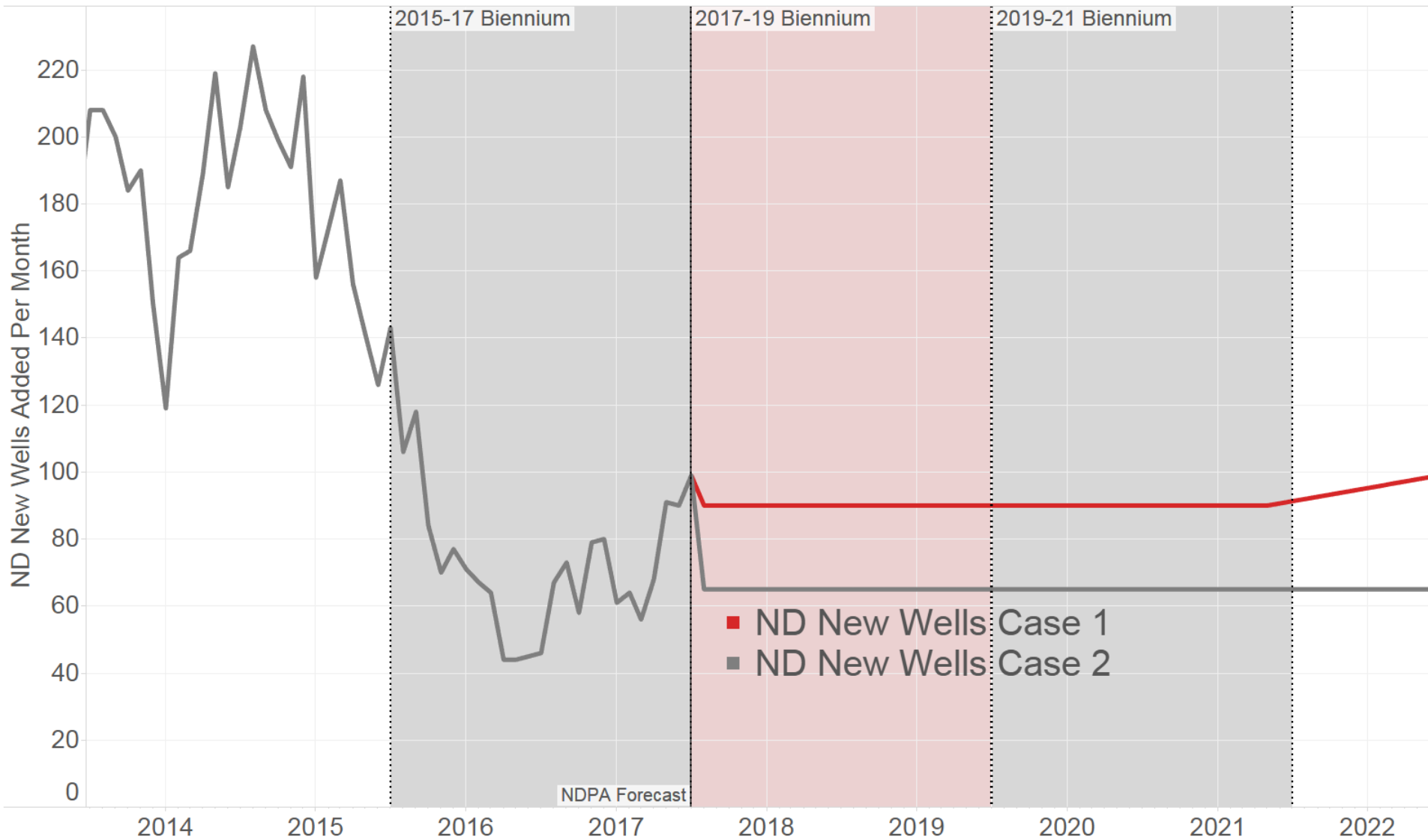
Statewide Gas Performance



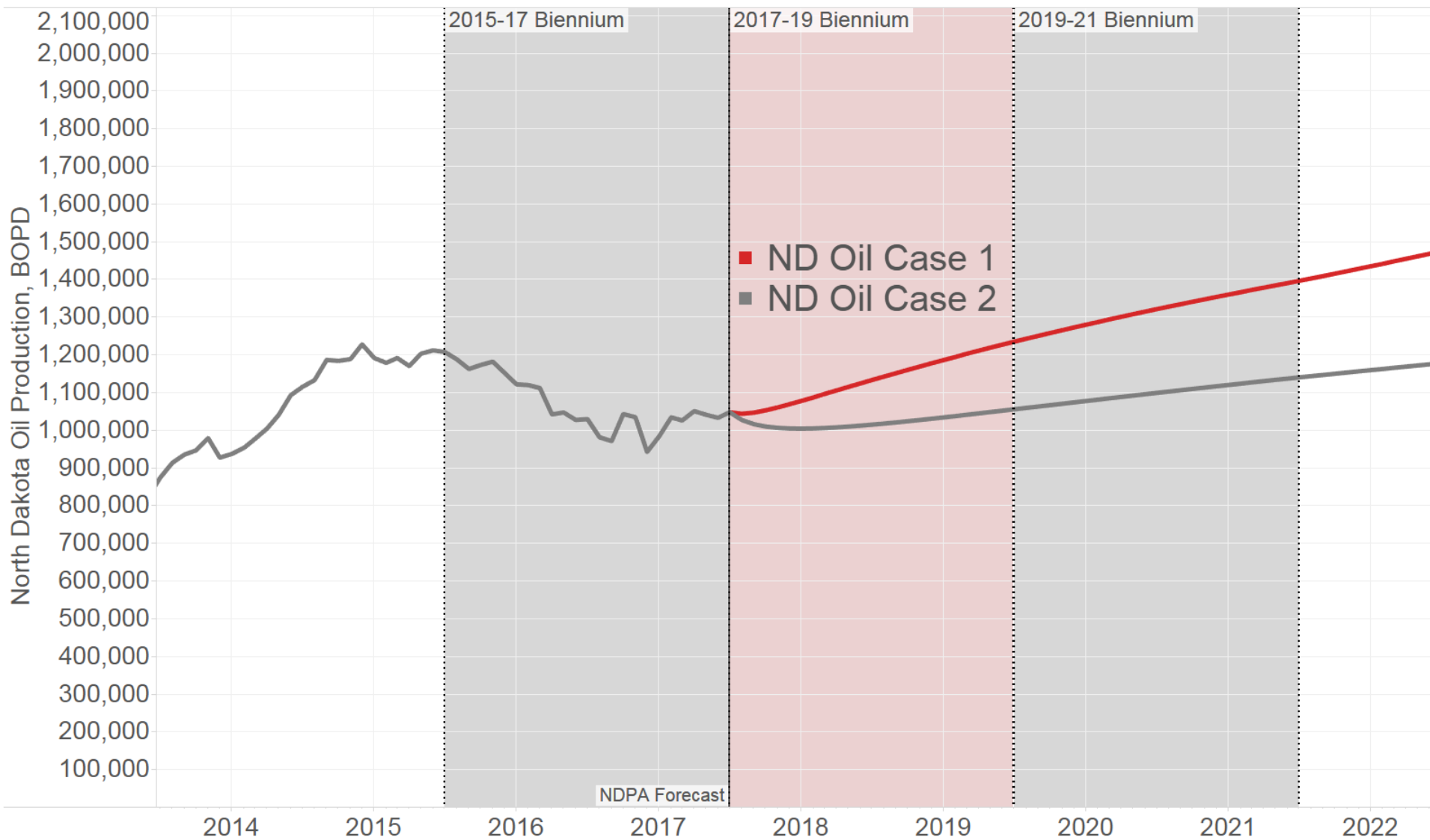
Average BKN/TF Well Performance Statewide (Minimum 1 bopd)



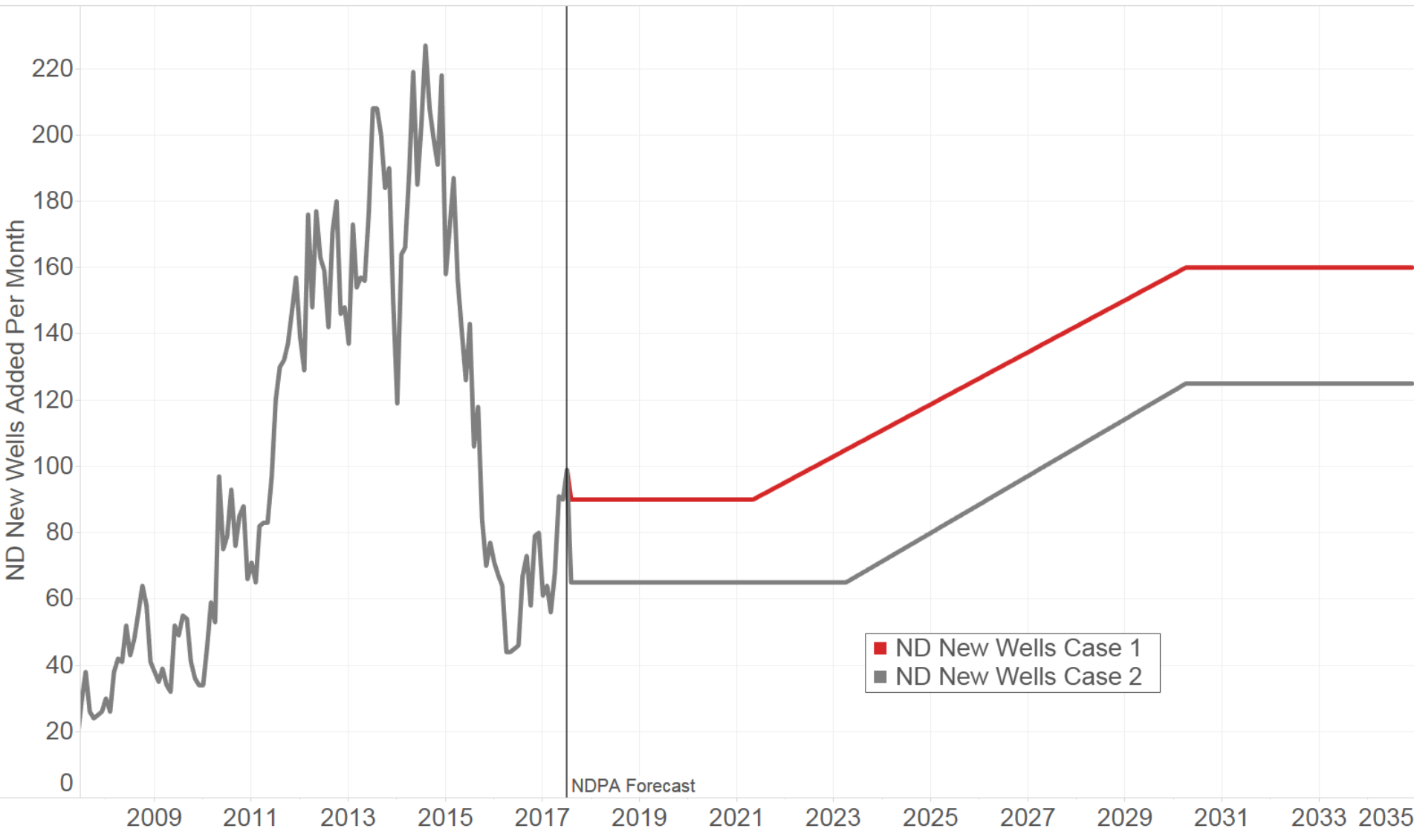
North Dakota Well Completion Forecast



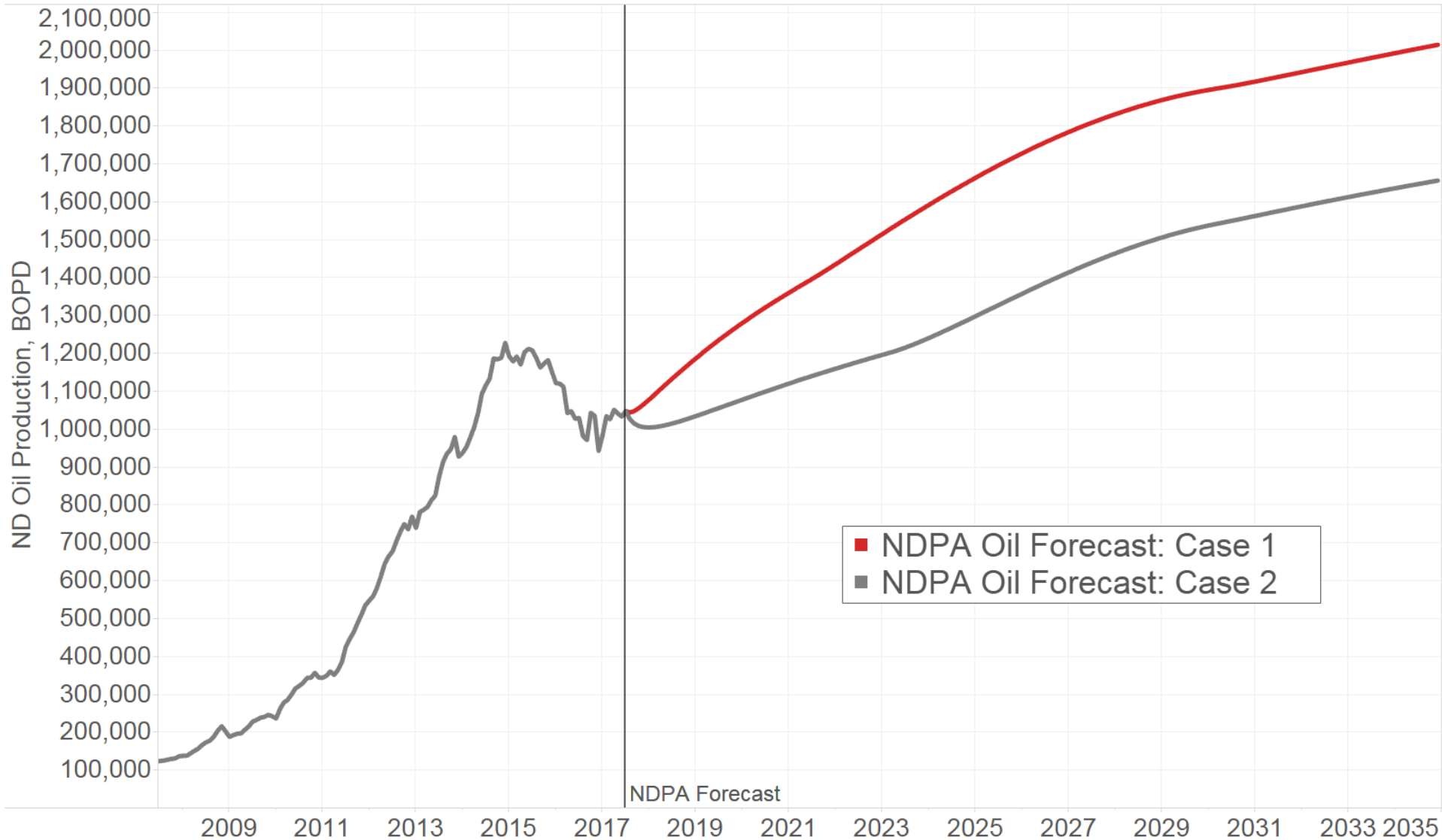
North Dakota Oil Production Forecast



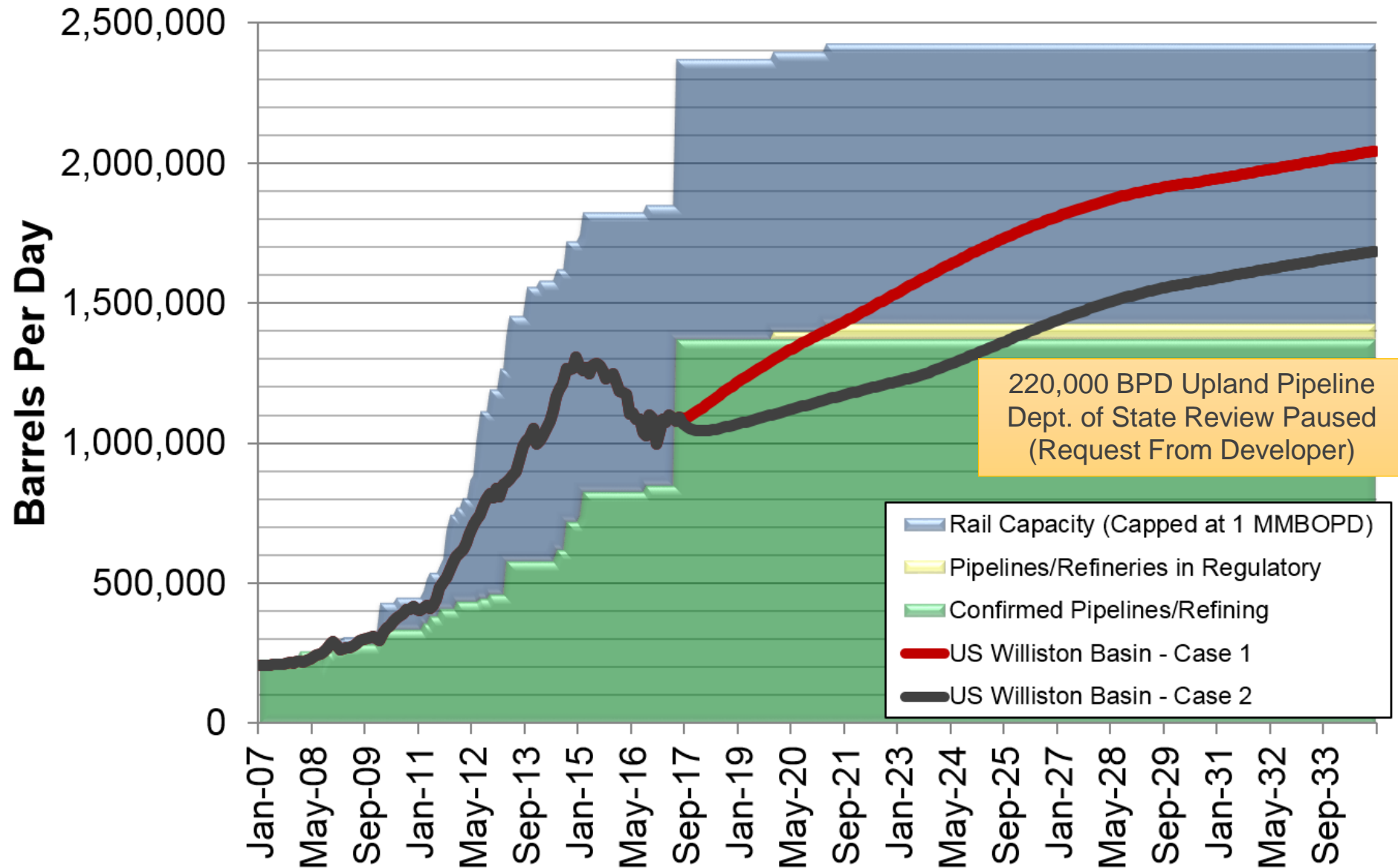
North Dakota Forecast Activity Assumptions



North Dakota Oil Production Forecast



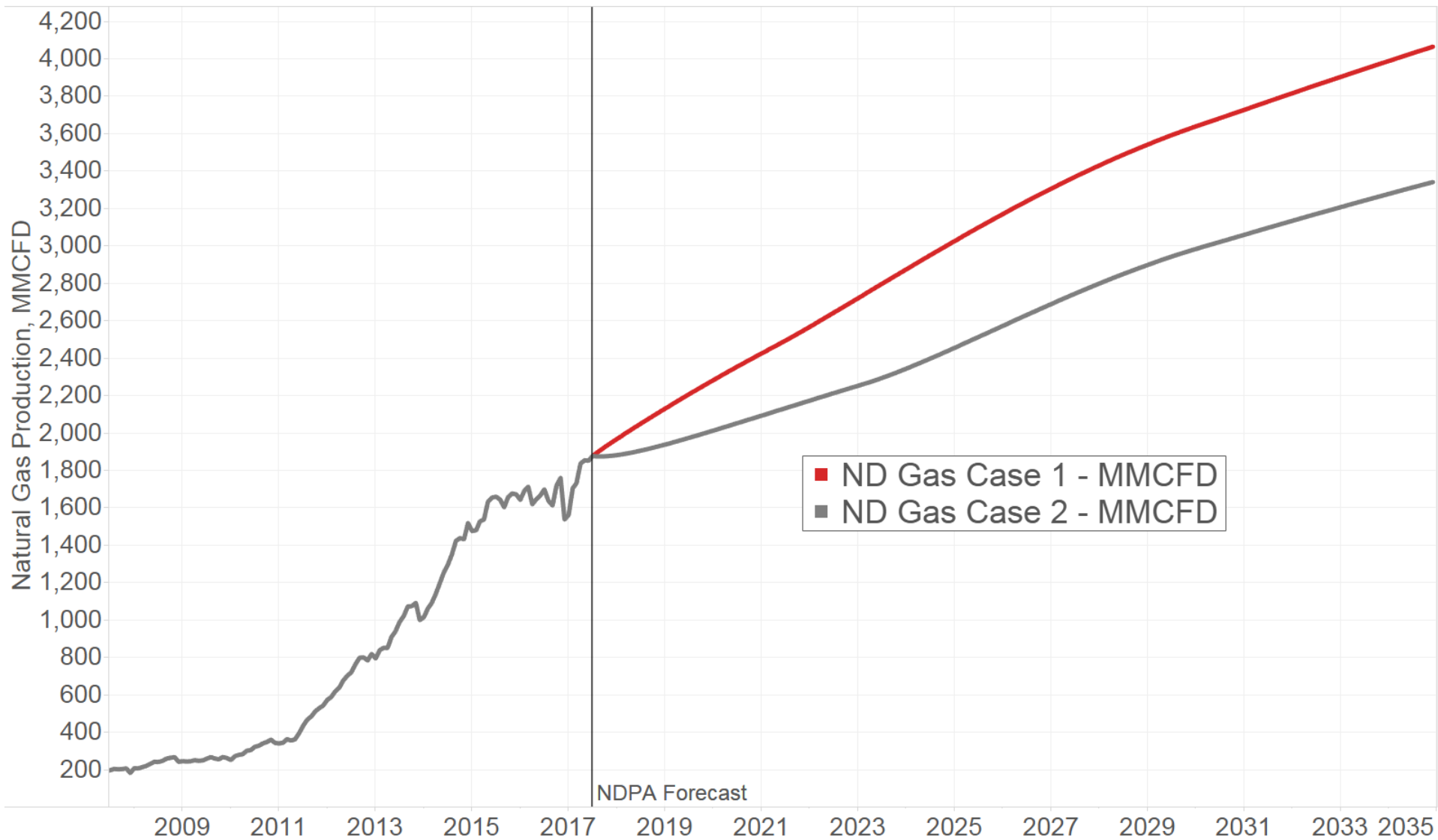
Williston Basin Oil Production & Export Capacity, BOPD



Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.

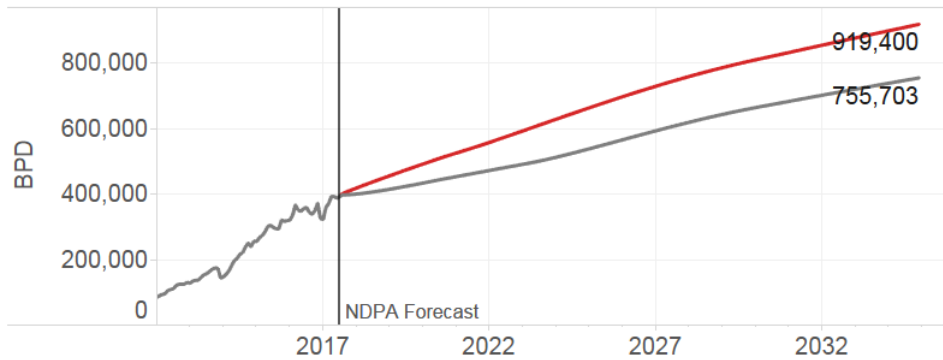


NDPA ND Gas Production Forecast

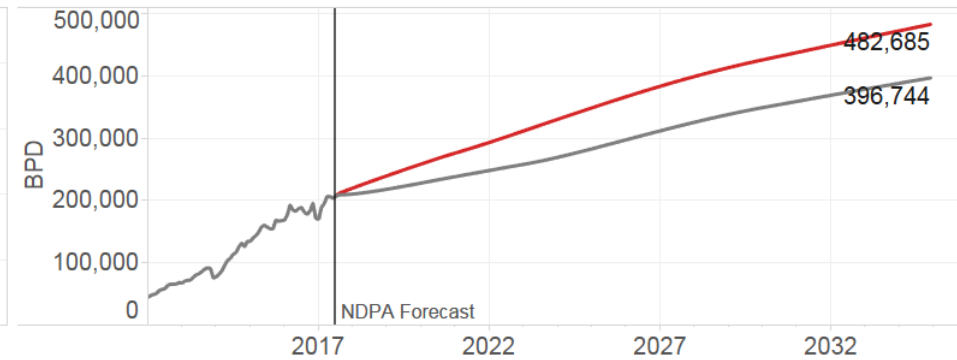


North Dakota Captured* NGL's

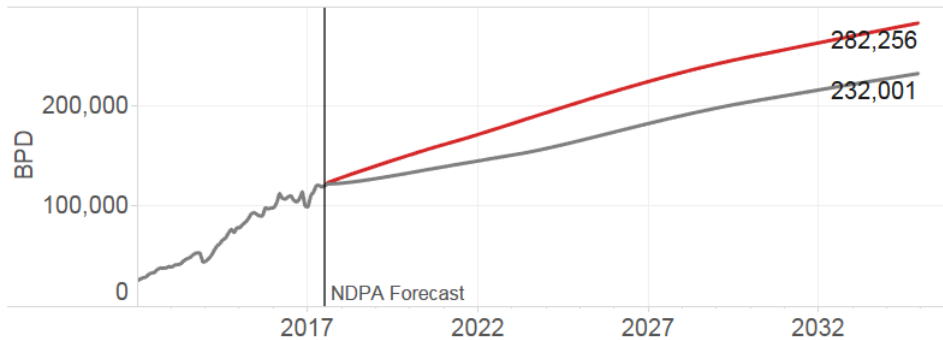
All Natural Gas Liquids



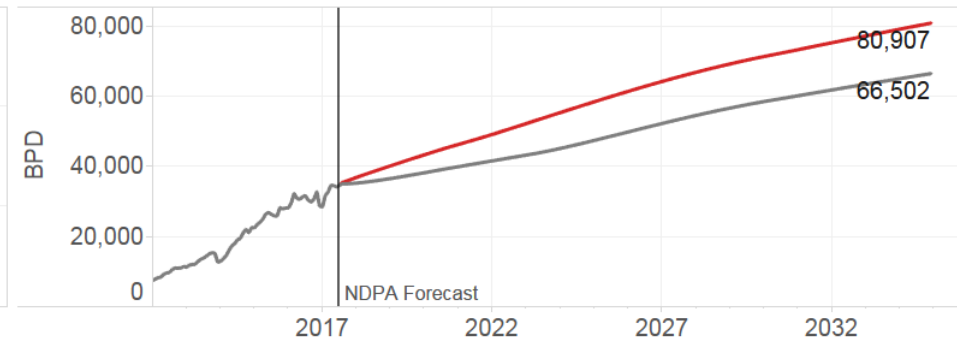
Ethane



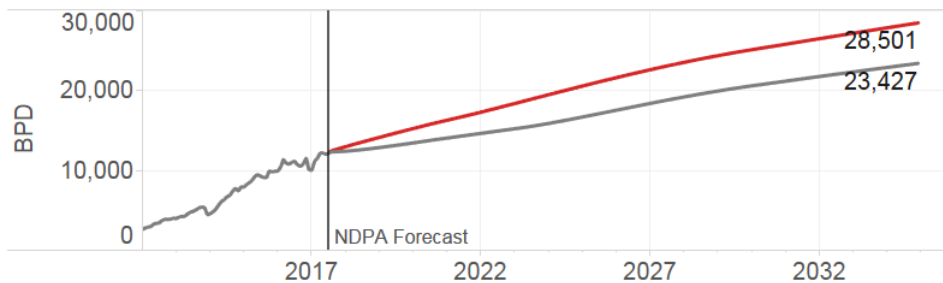
Propane



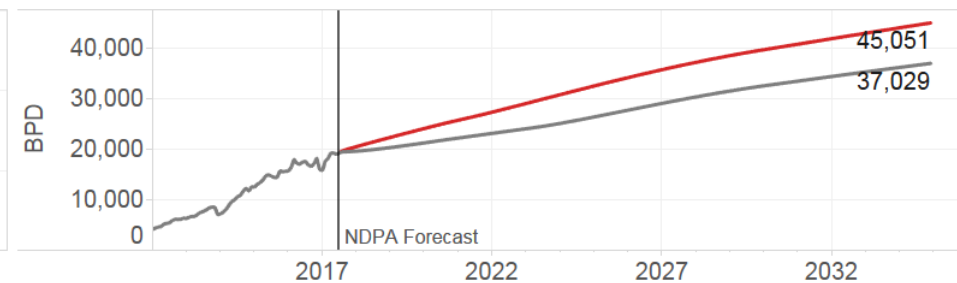
Butane



Isobutane



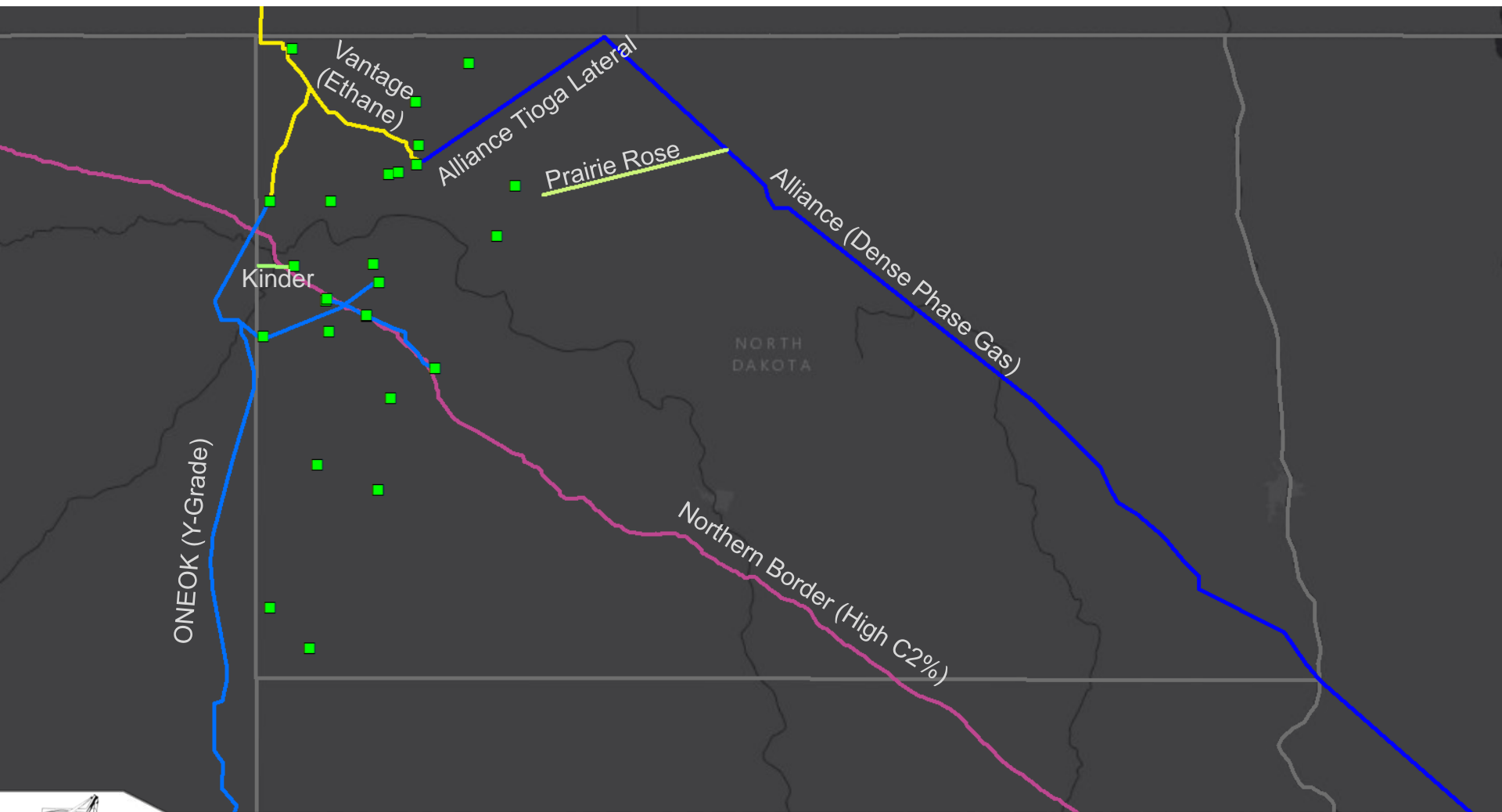
Natural Gasoline



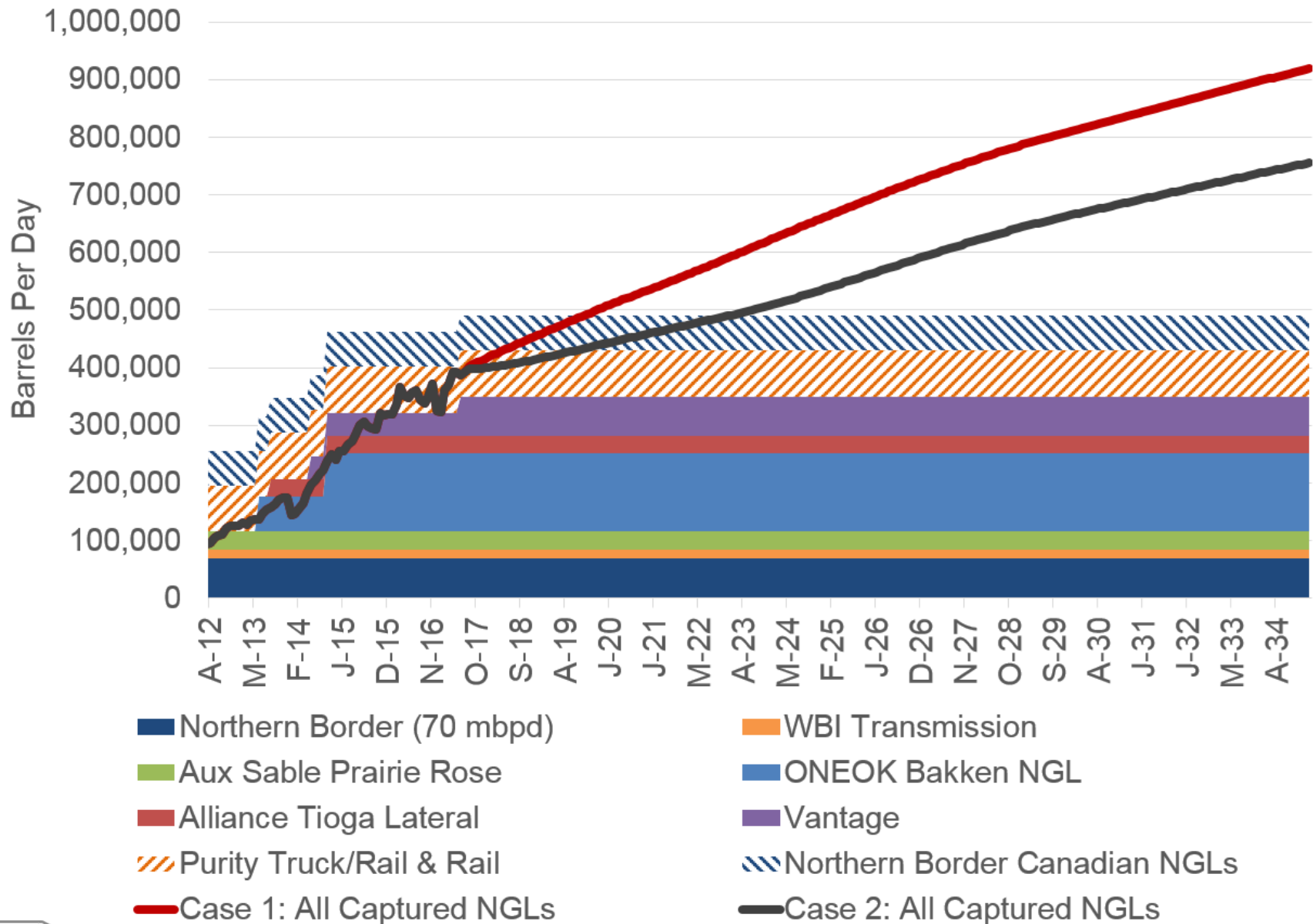
**Non-flared NGL's & Assumes 10 GPM*



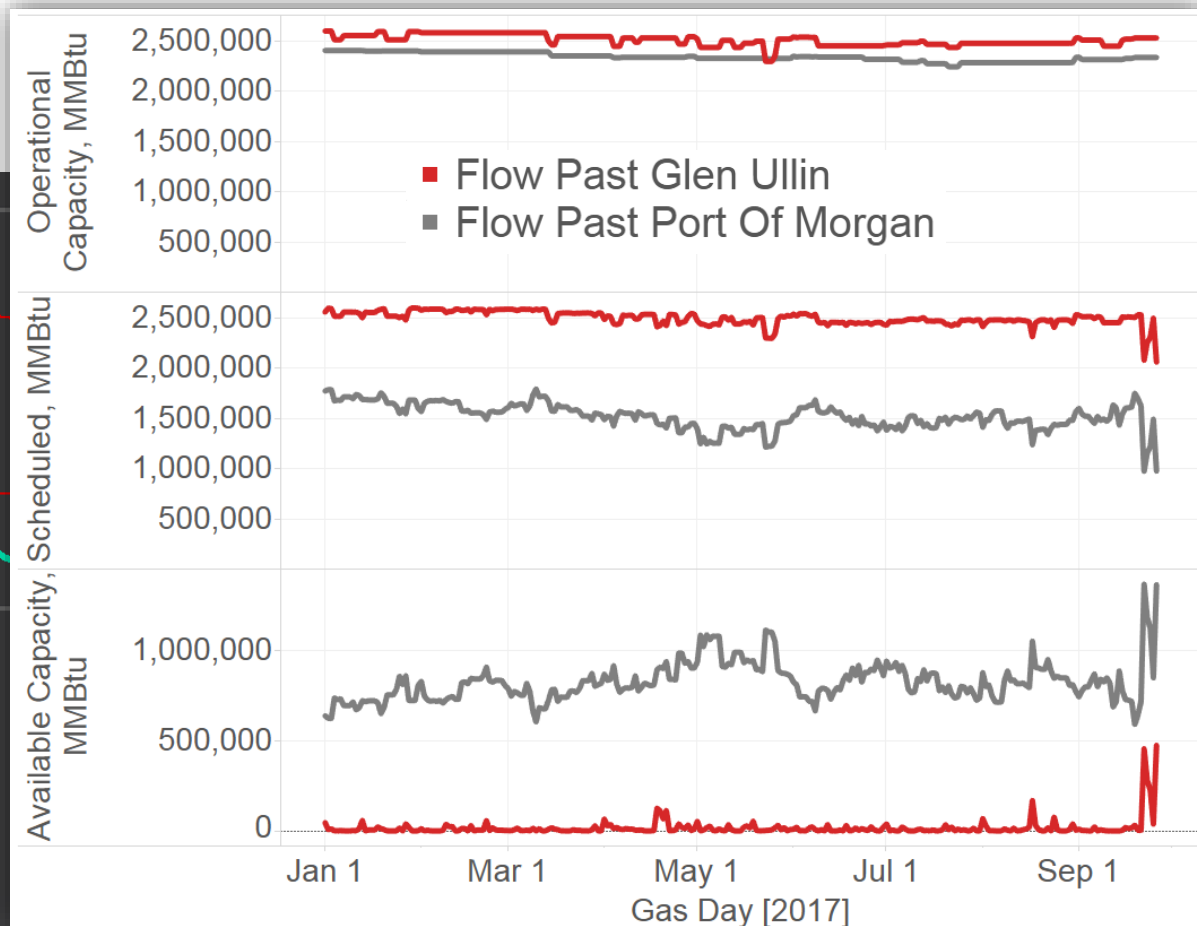
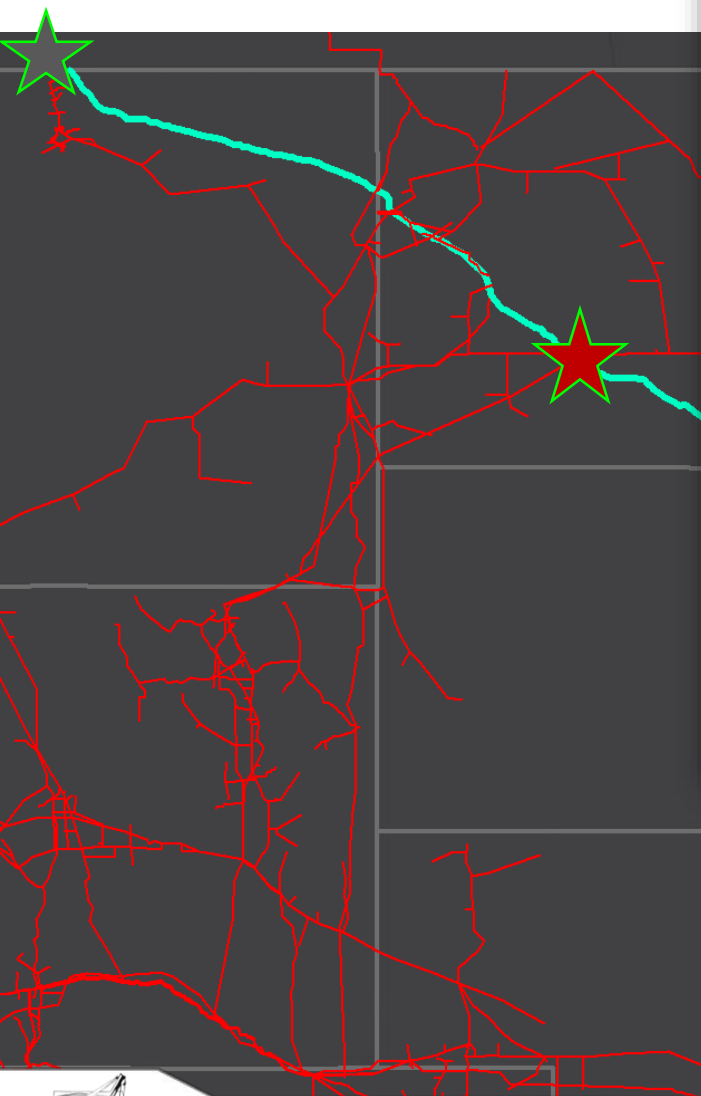
Major NGL Pipeline and Processing Infrastructure



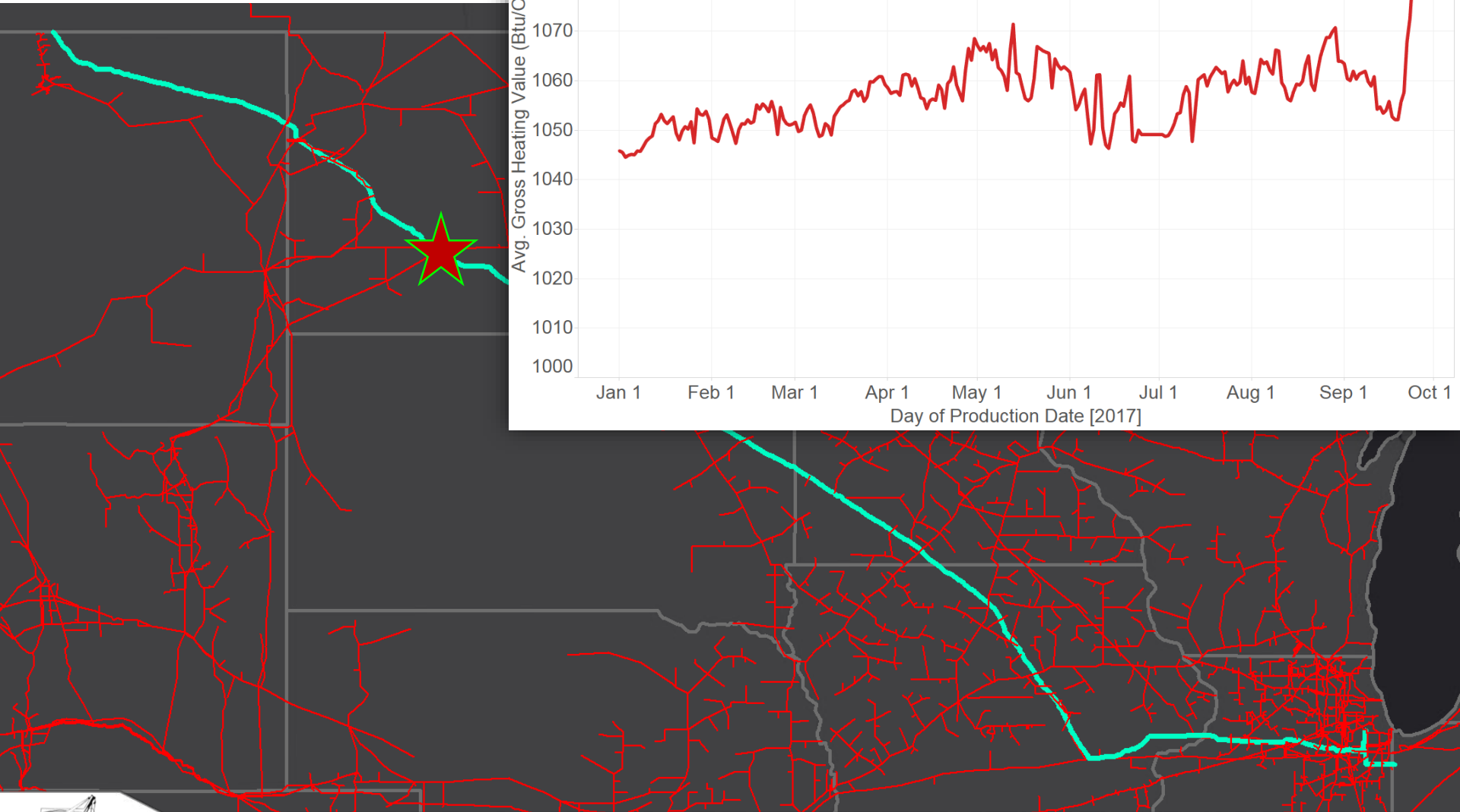
NGL Takeaway Options Are Limited



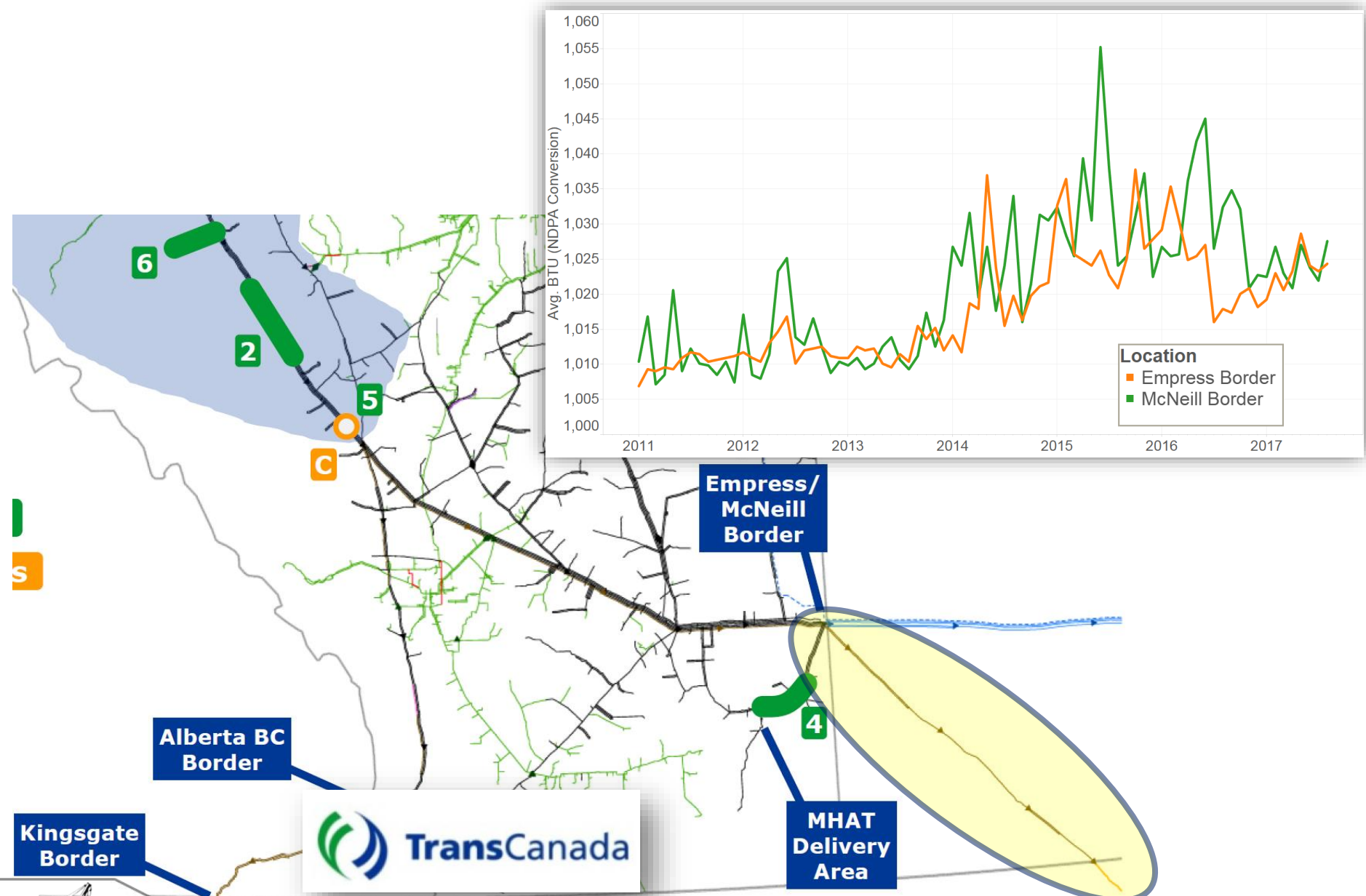
Northern Border Pipeline* (2017)



Northern Border Glen Ullin* (2017)



Foothills Pipeline

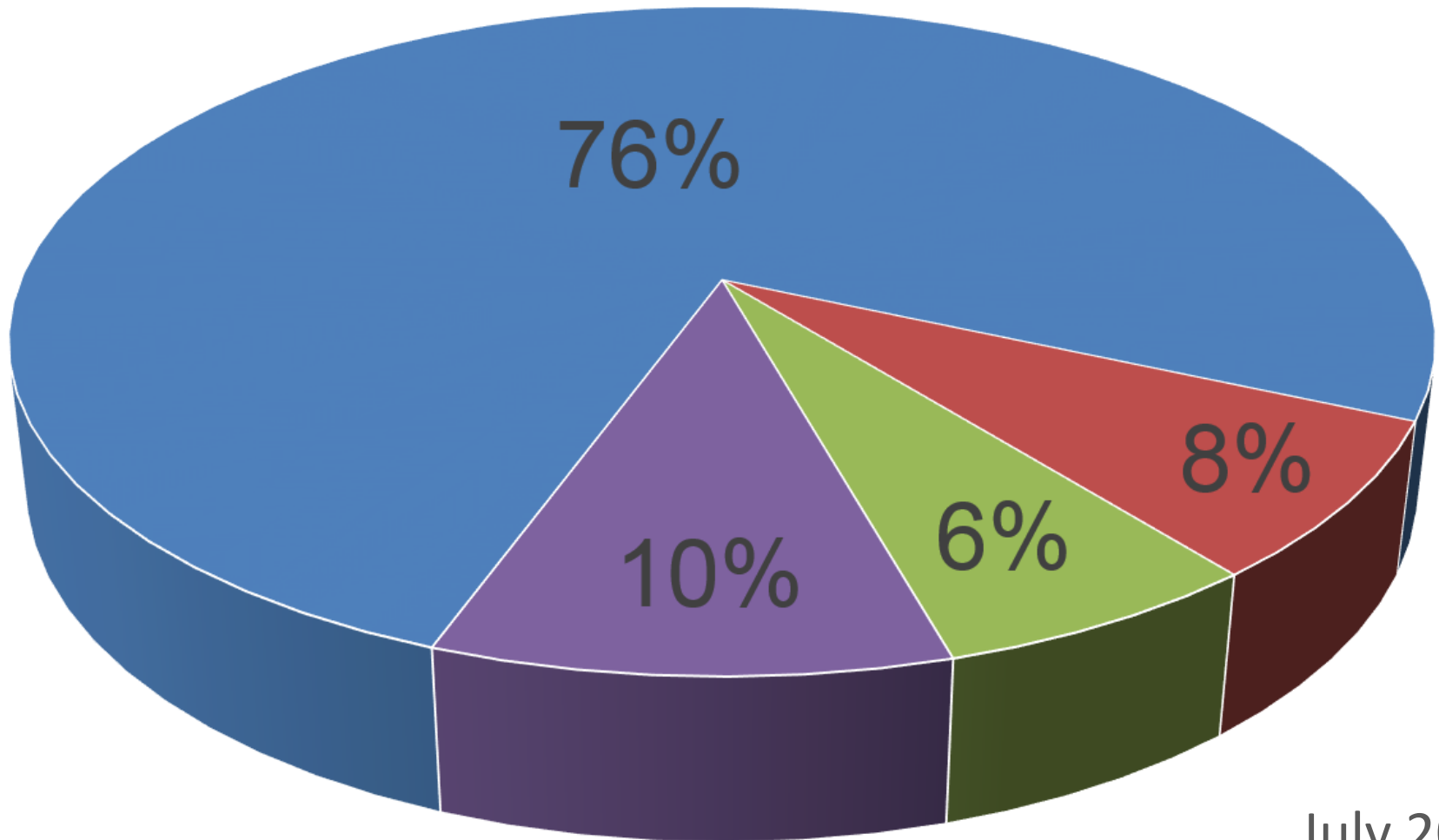


Latest Figures



September 2017 Monthly Update
North Dakota Pipeline Authority
Justin J. Kringstad
September 15, 2017

Estimated Williston Basin Oil Transportation

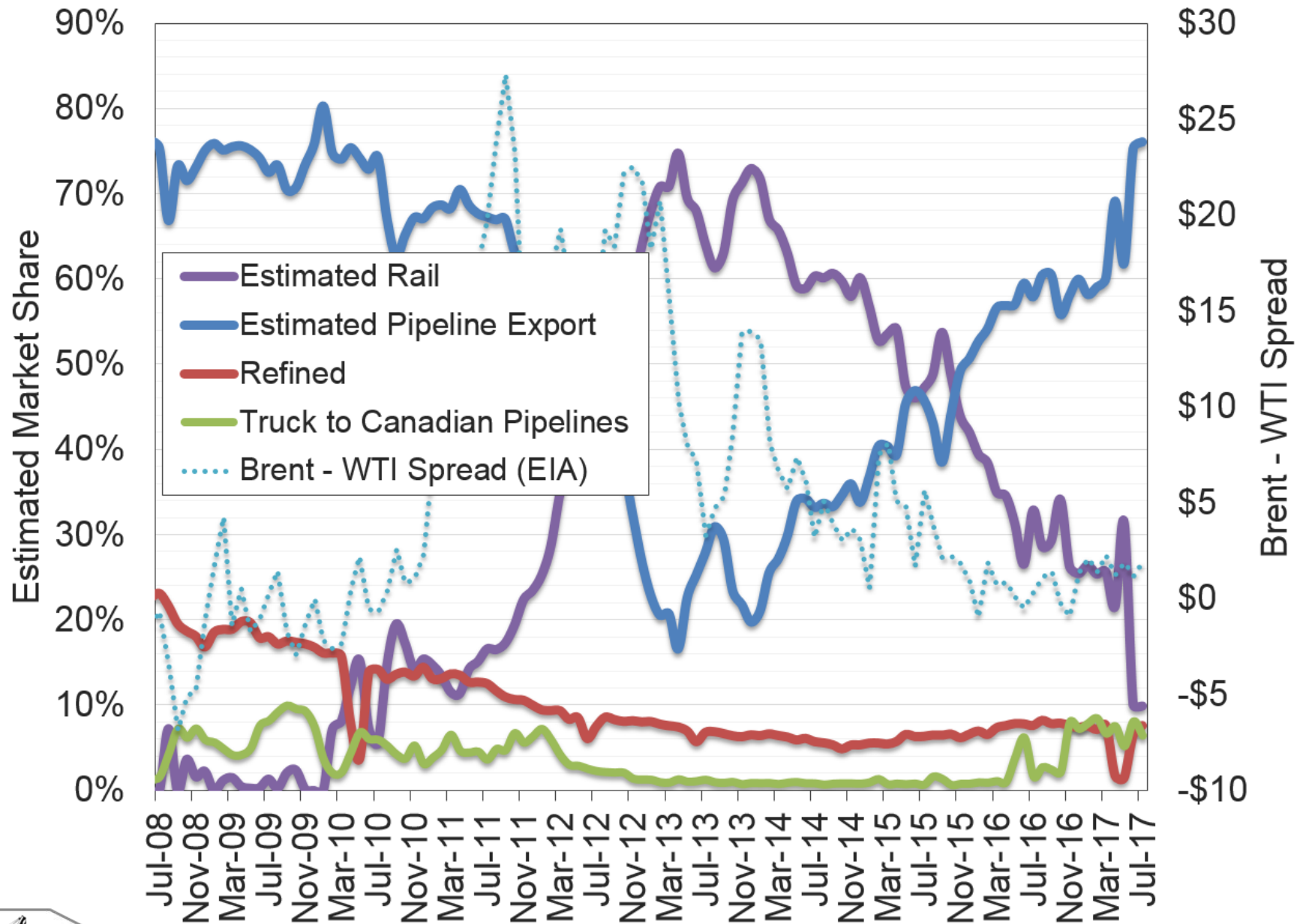


July 2017

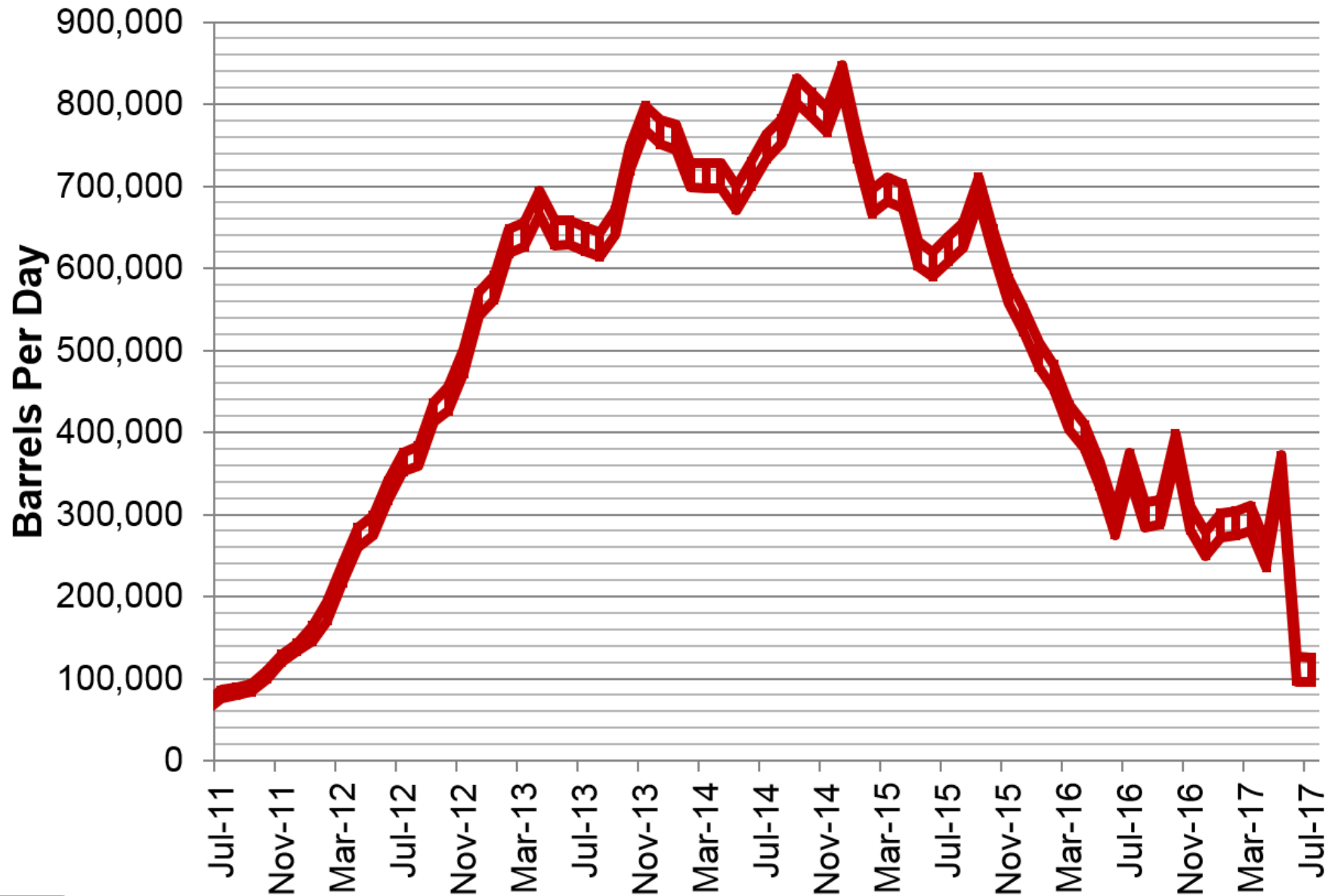
- Pipeline Export
- Refined
- Truck to Canadian Pipelines
- Estimated Rail



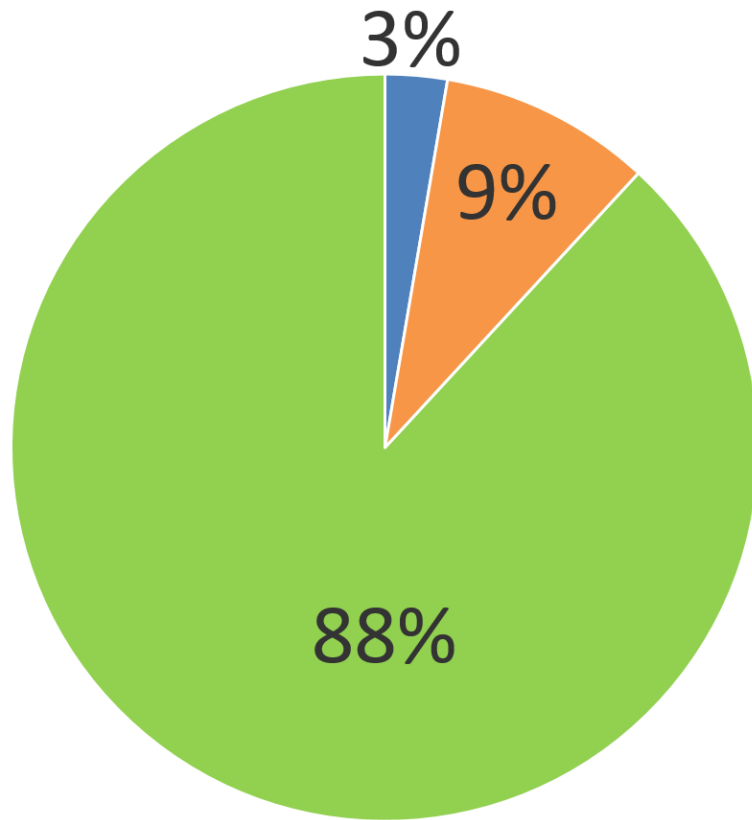
Estimated Williston Basin Oil Transportation



Estimated ND Rail Export Volumes



Solving the Flaring Challenge



Statewide

GREEN – % of gas captured and sold
Blue – % flared from zero sales wells
Orange – % flared from wells with at least one mcf sold.

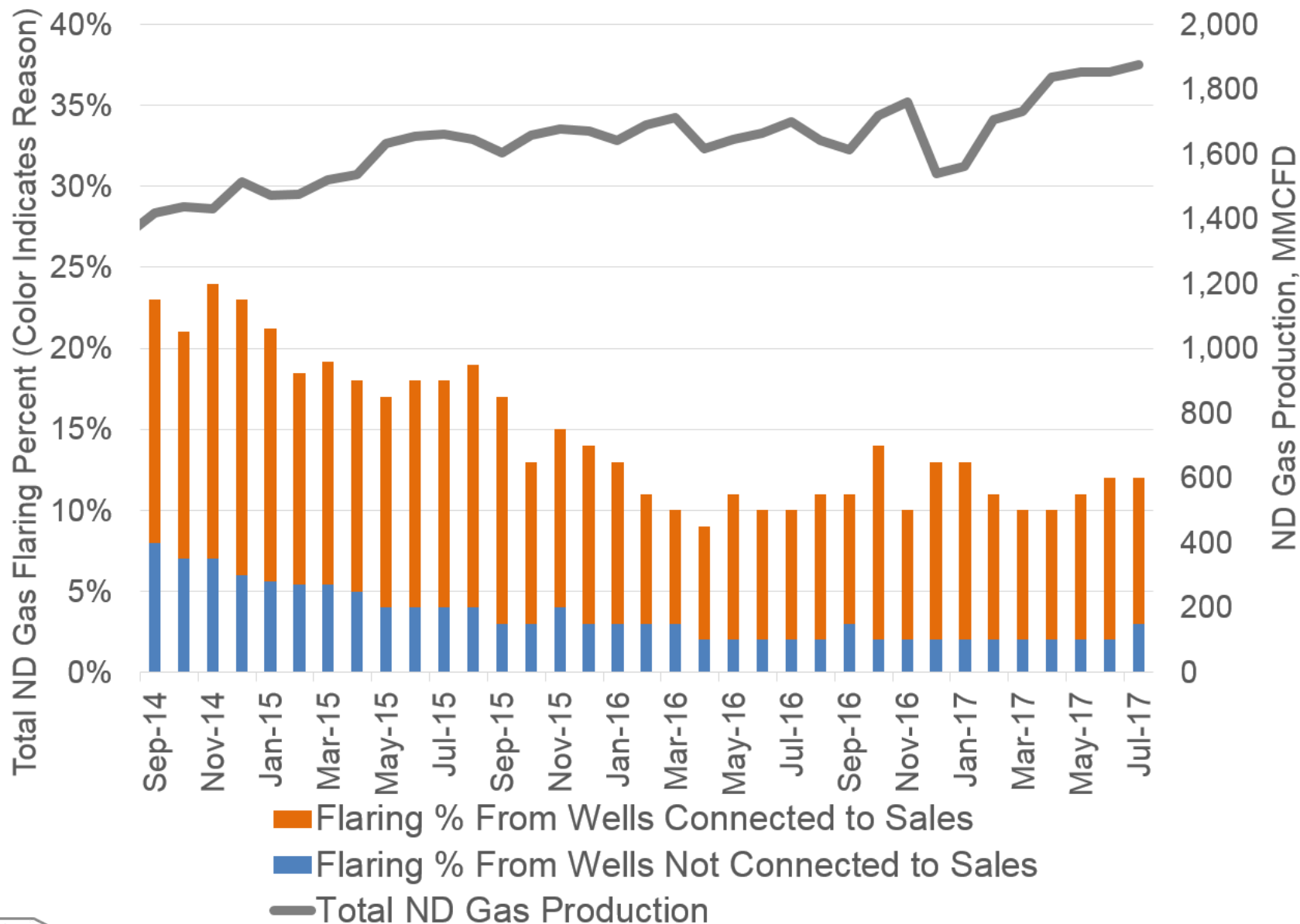
Simple Terms

Blue – Lack of pipelines
Orange – Challenges on existing infrastructure

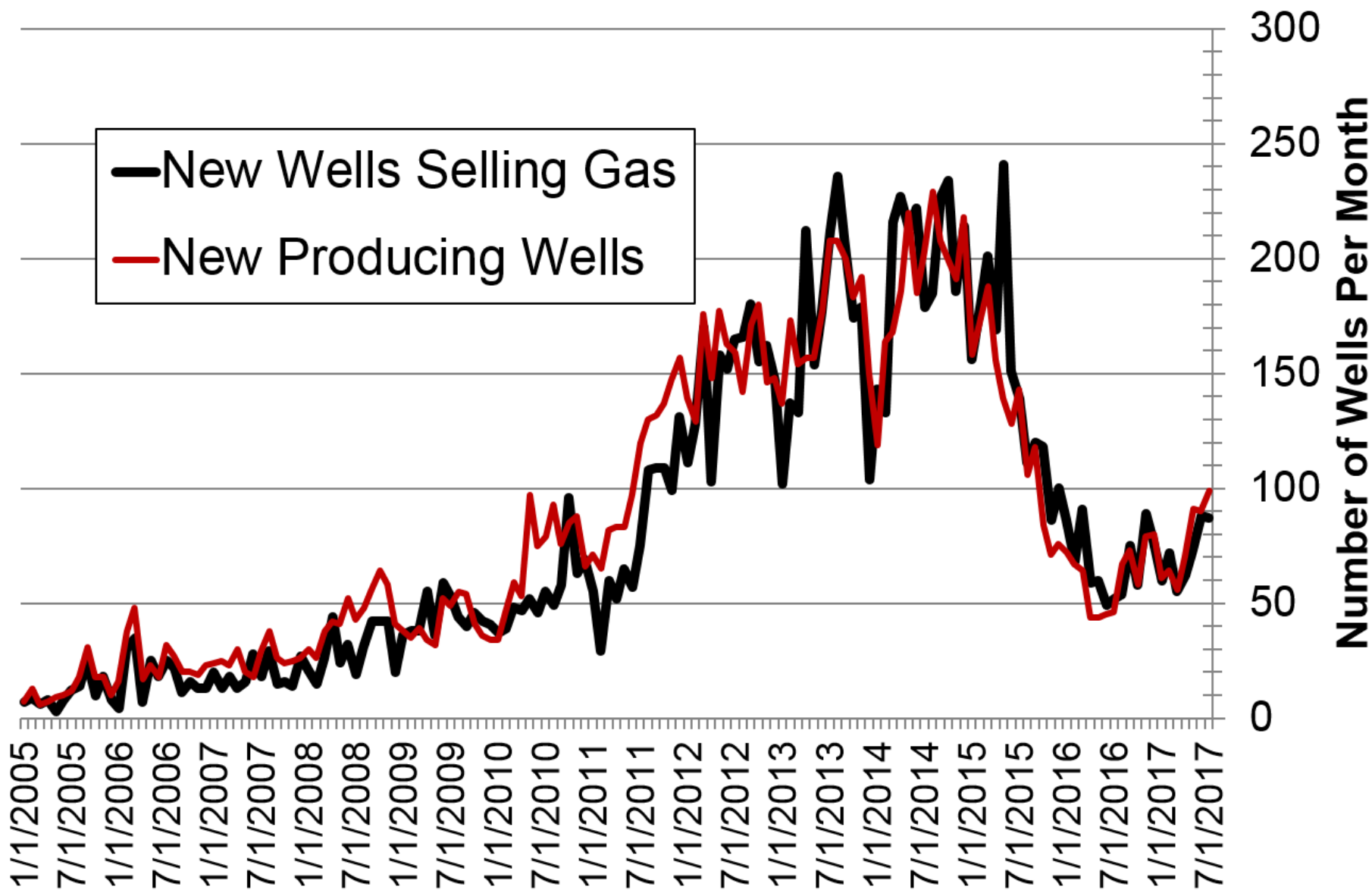
July 2017 Data – Non-Confidential Wells



Solving the Flaring Challenge



Solving the Flaring Challenge



Bakken Refracs

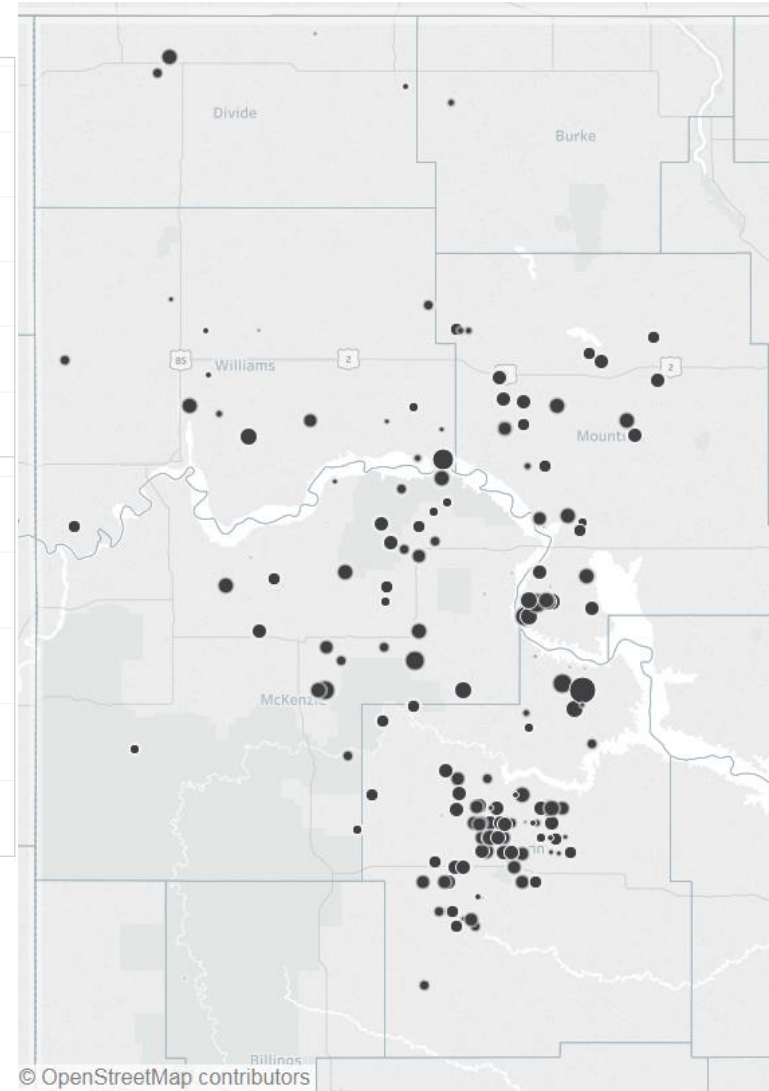
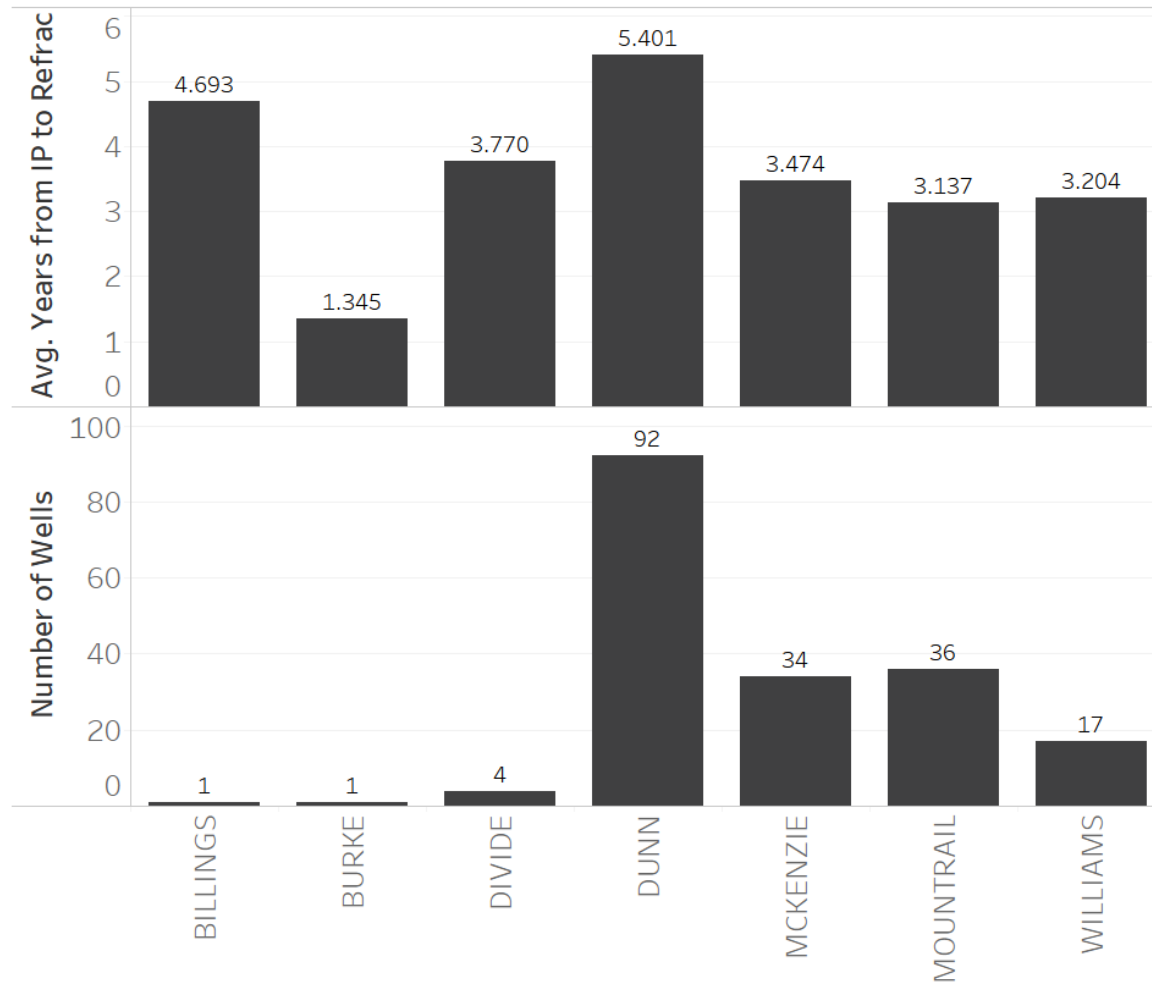
Updated From Previous Refrac Work

185 Wells, Up From 142

List Cleaned Up With DMR Assistance



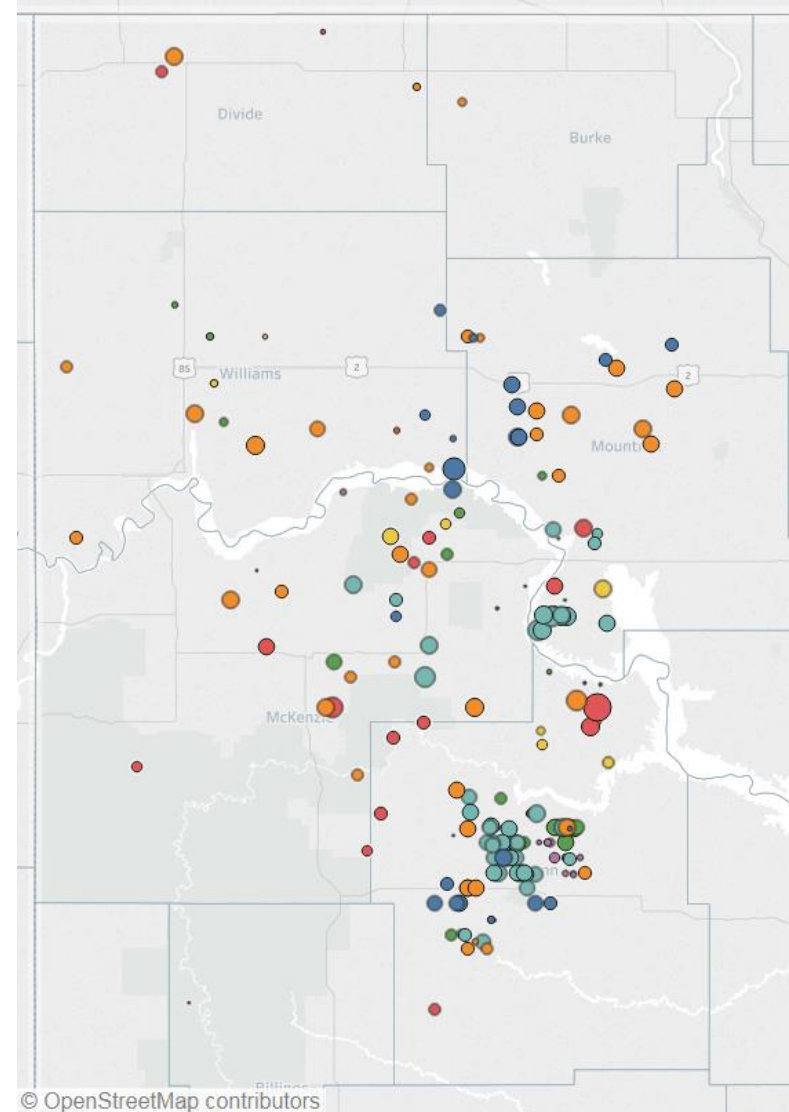
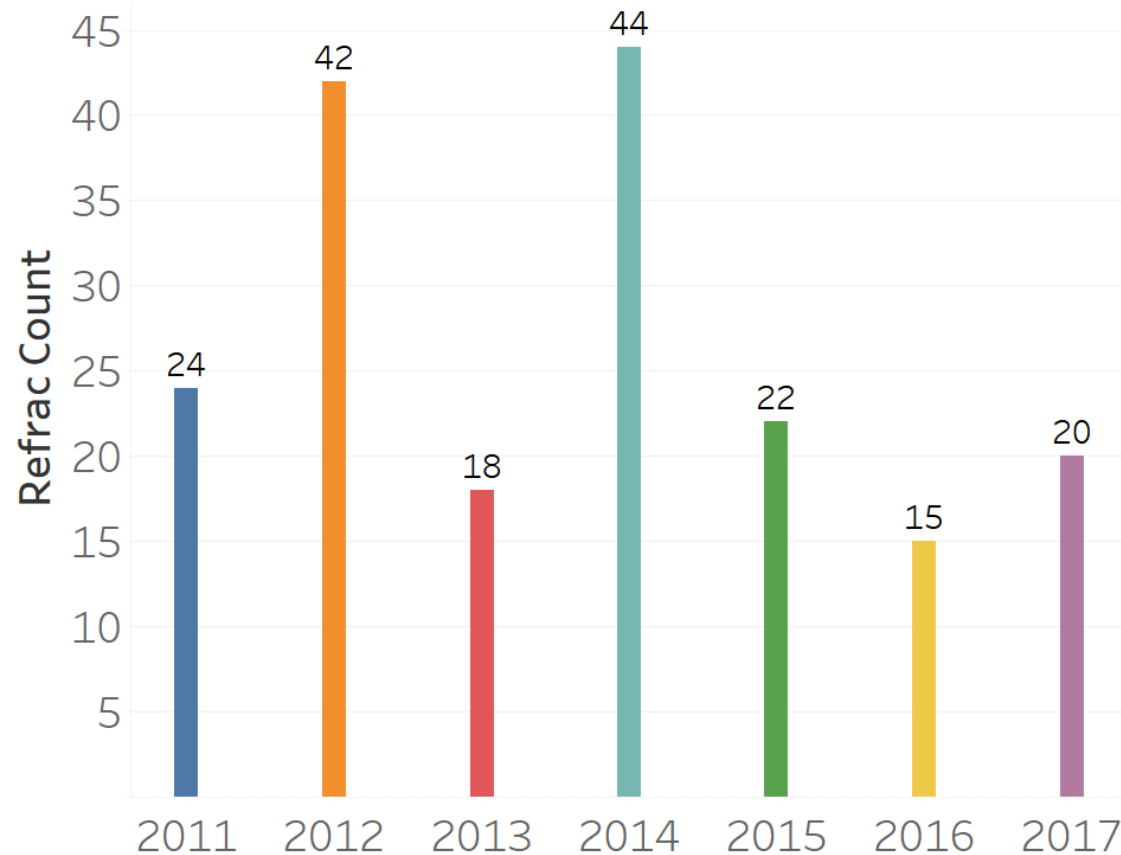
Refracs In the Bakken*



**While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.*



Refrac Completion Year*

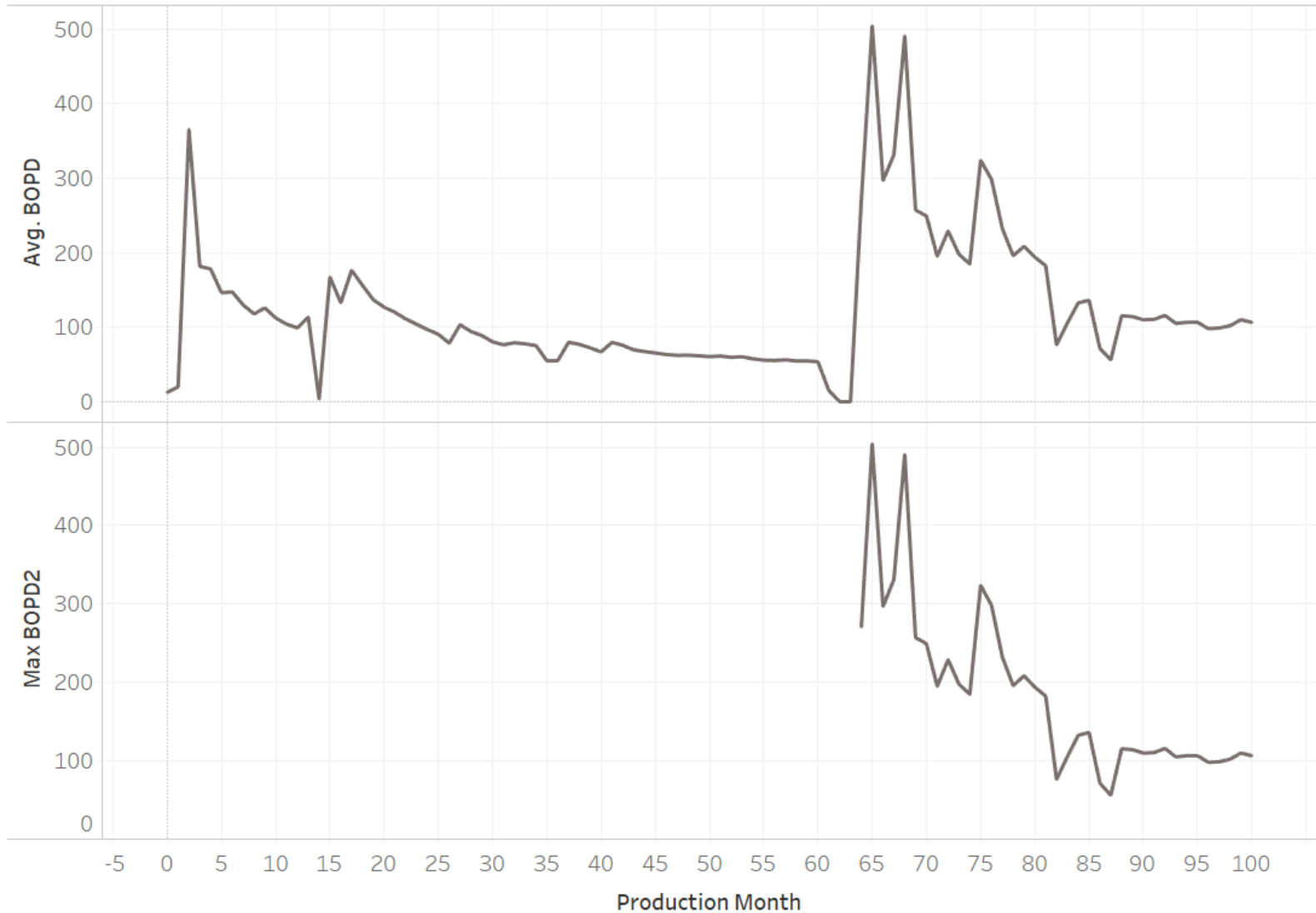


**While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.*



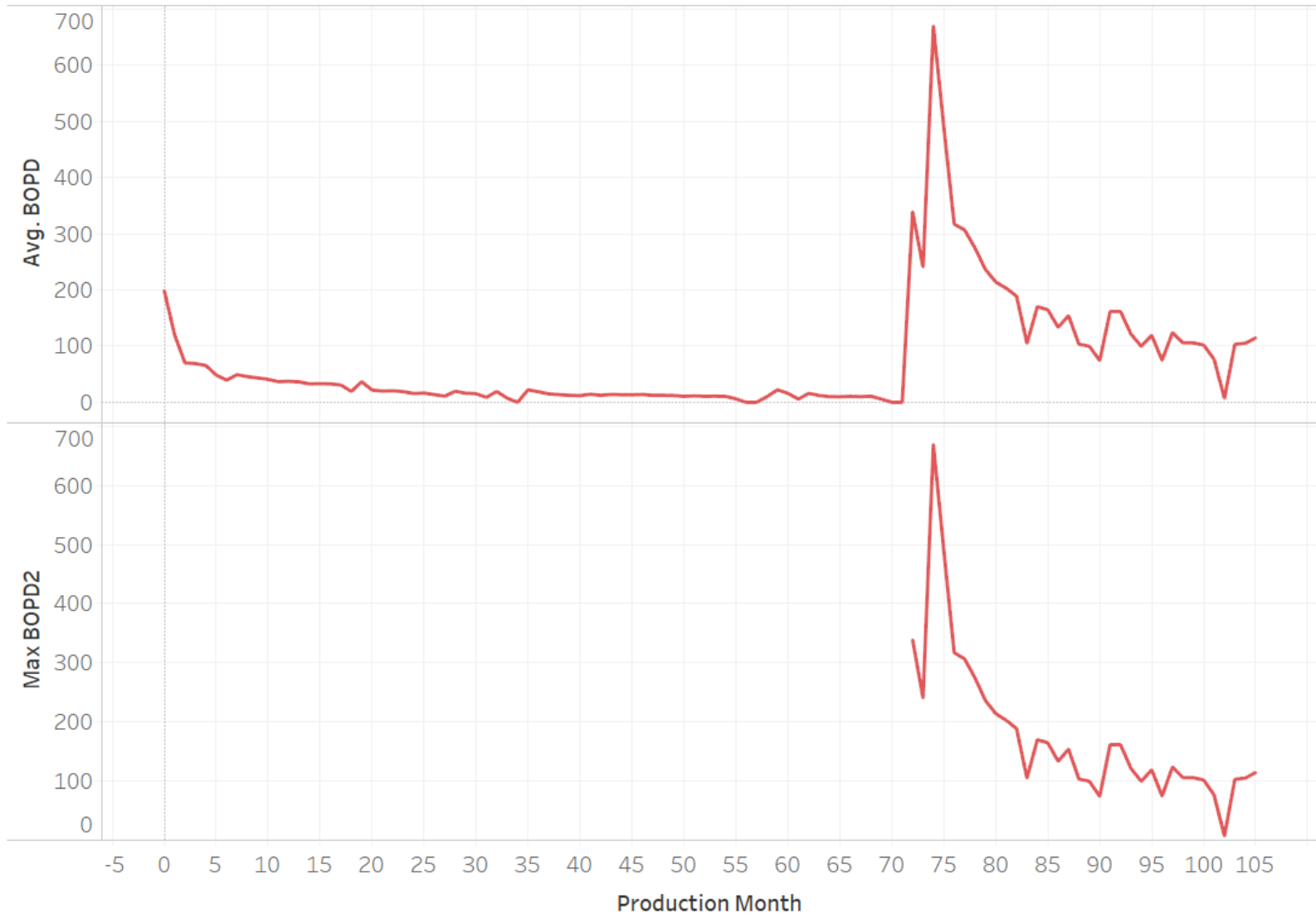
Example: Pre/Post Refrac Oil

BOPD



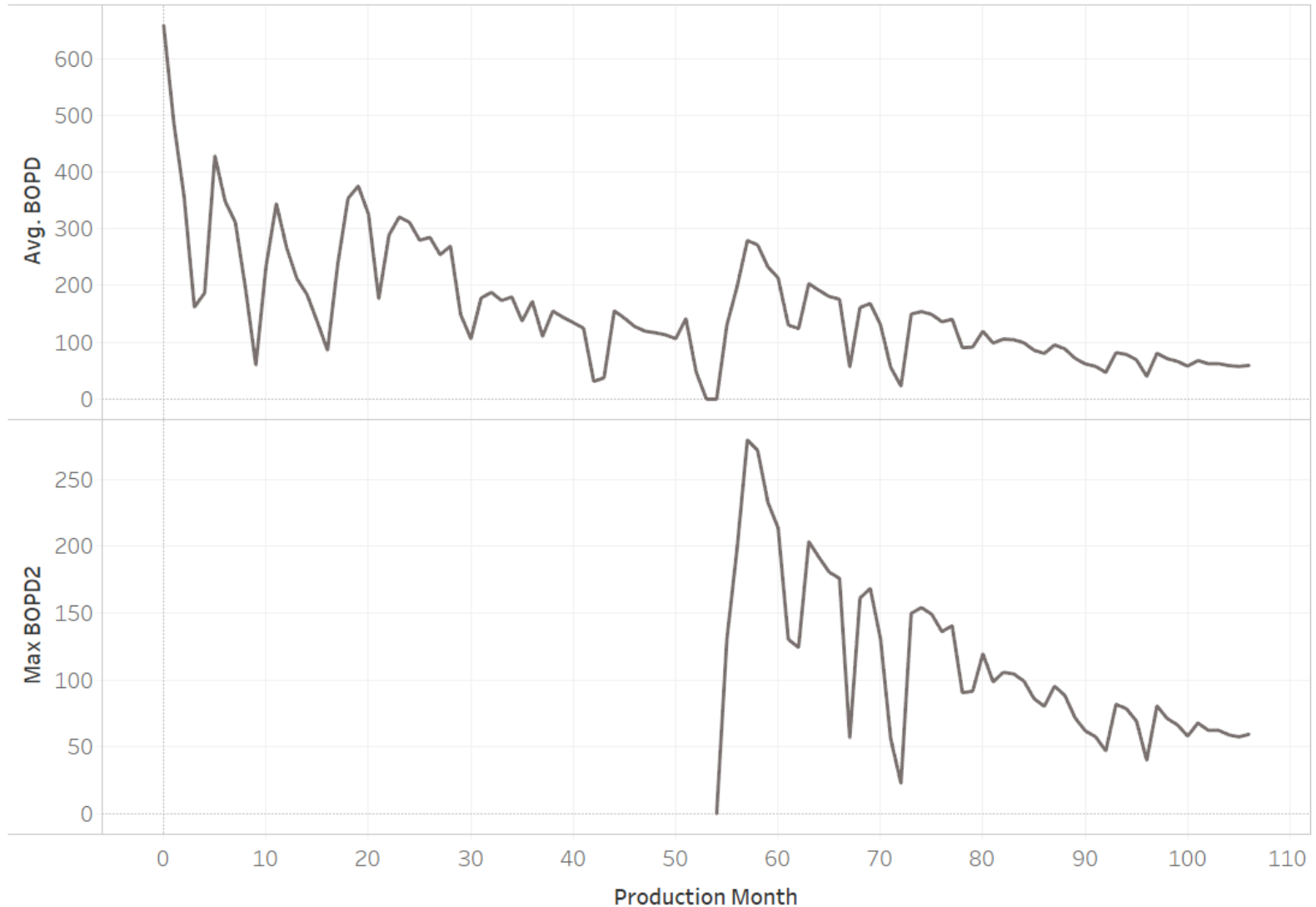
Example: Pre/Post Refrac Oil

BOPD



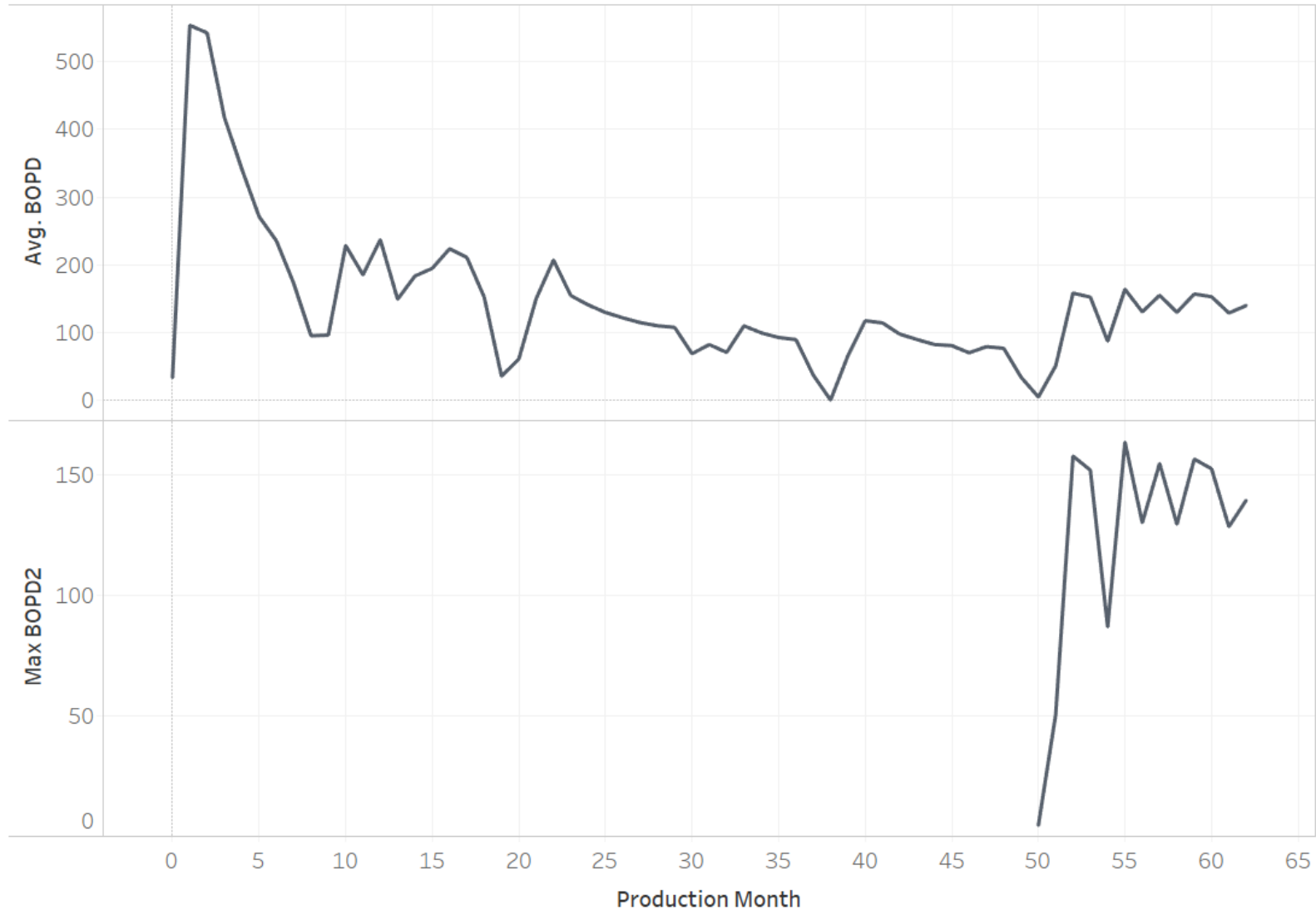
Example: Pre/Post Refrac Oil

BOPD

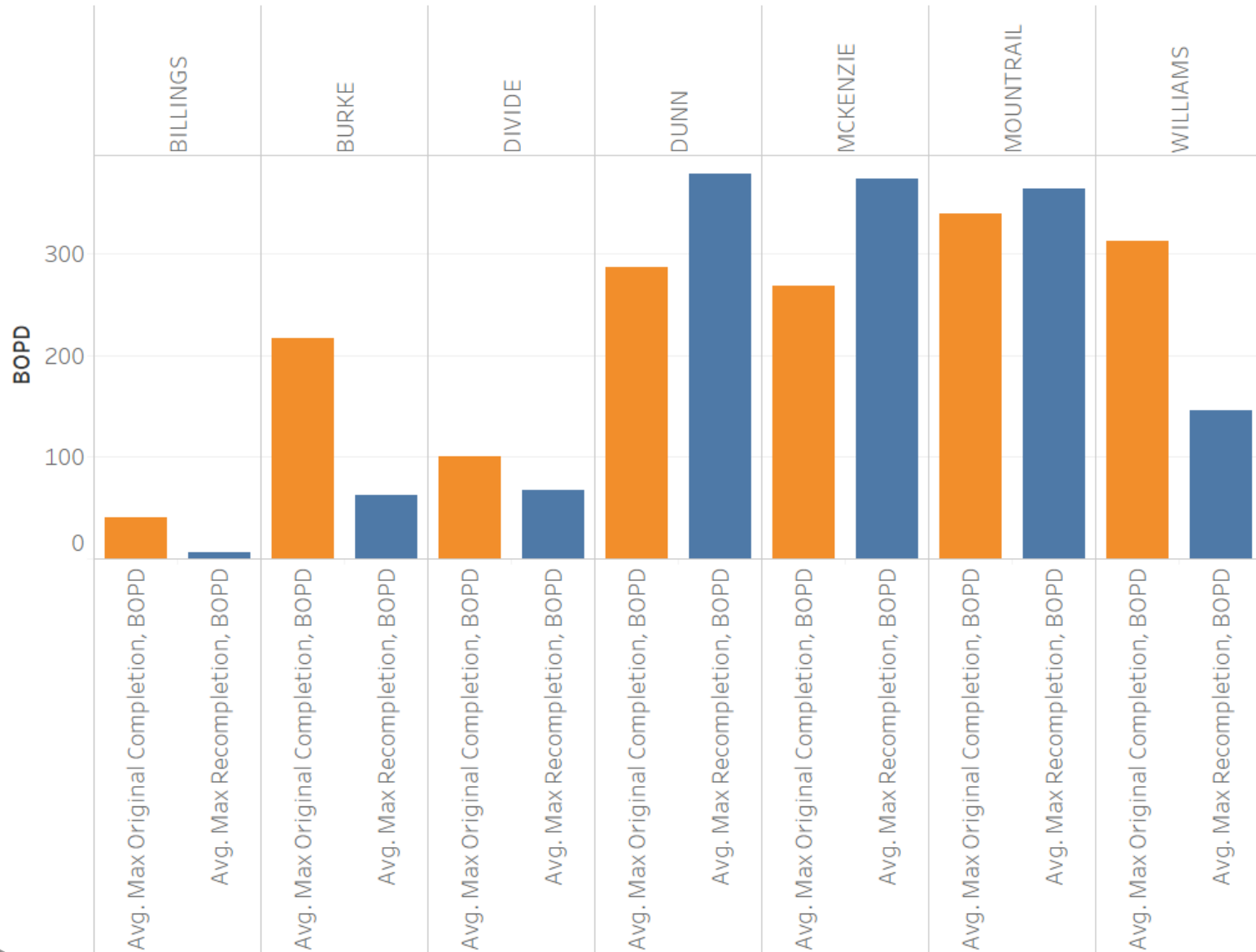


Example: Pre/Post Refrac Oil

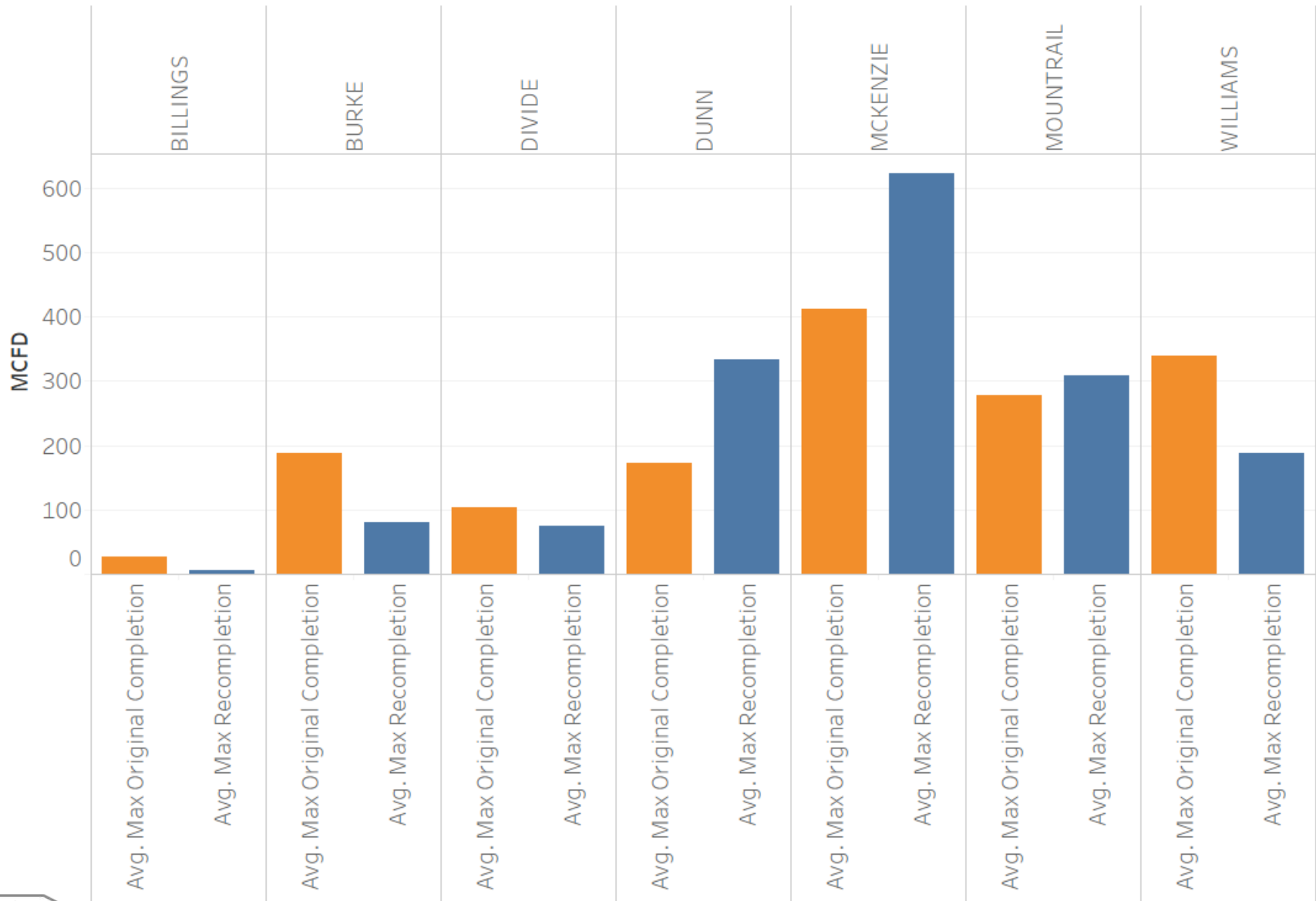
BOPD



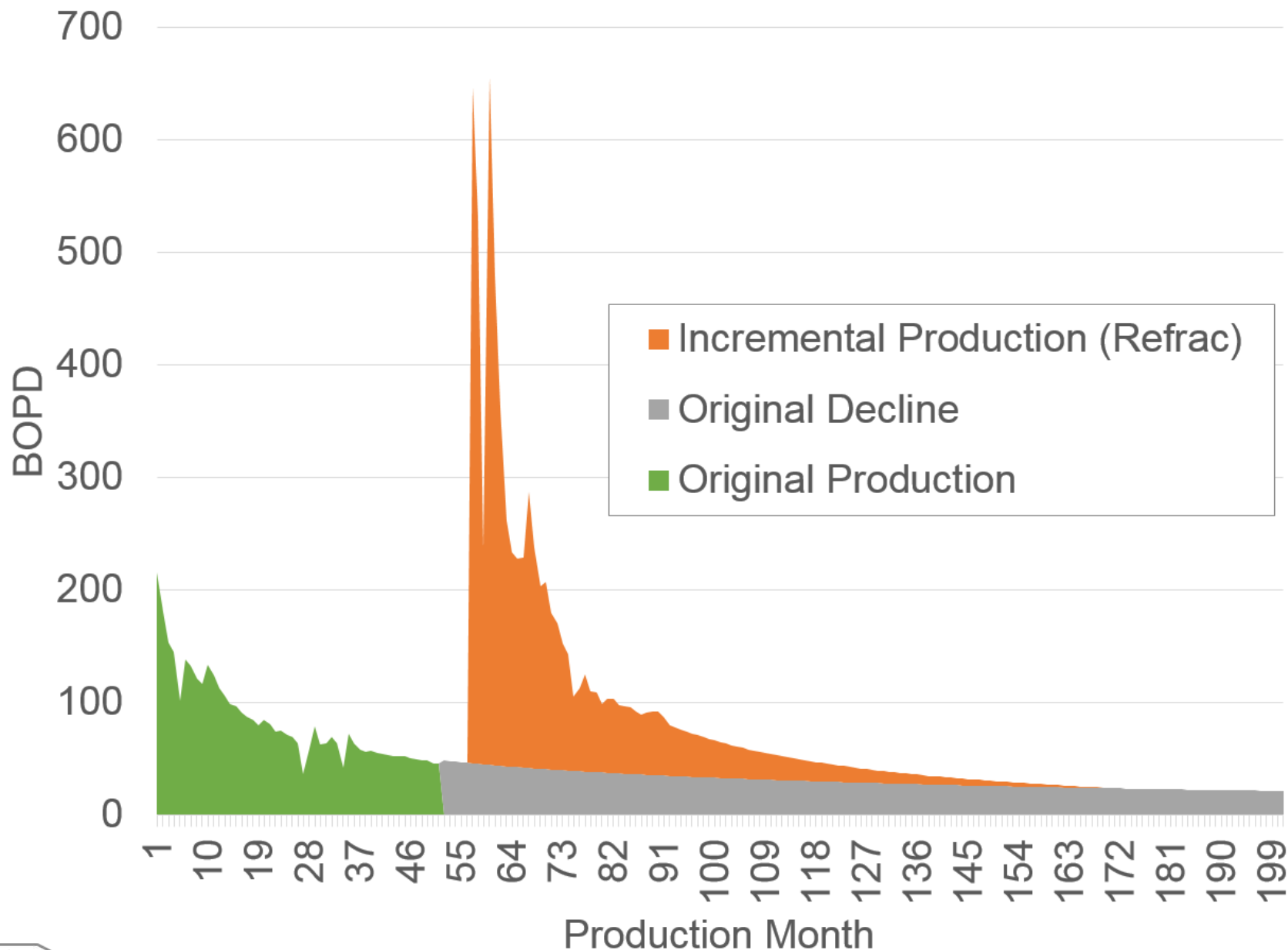
Performance Pre/Post Refrac



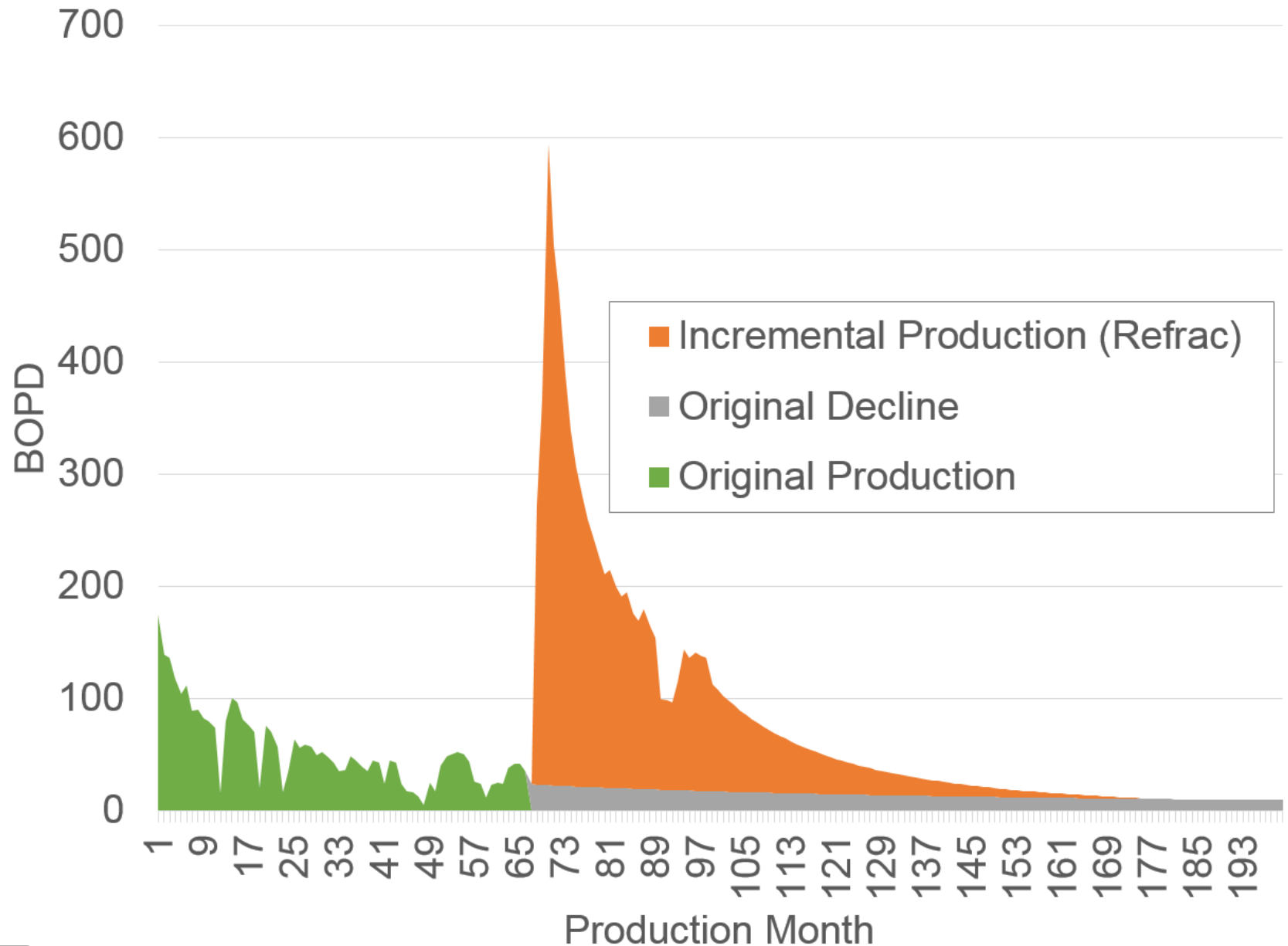
Performance Pre/Post Refrac



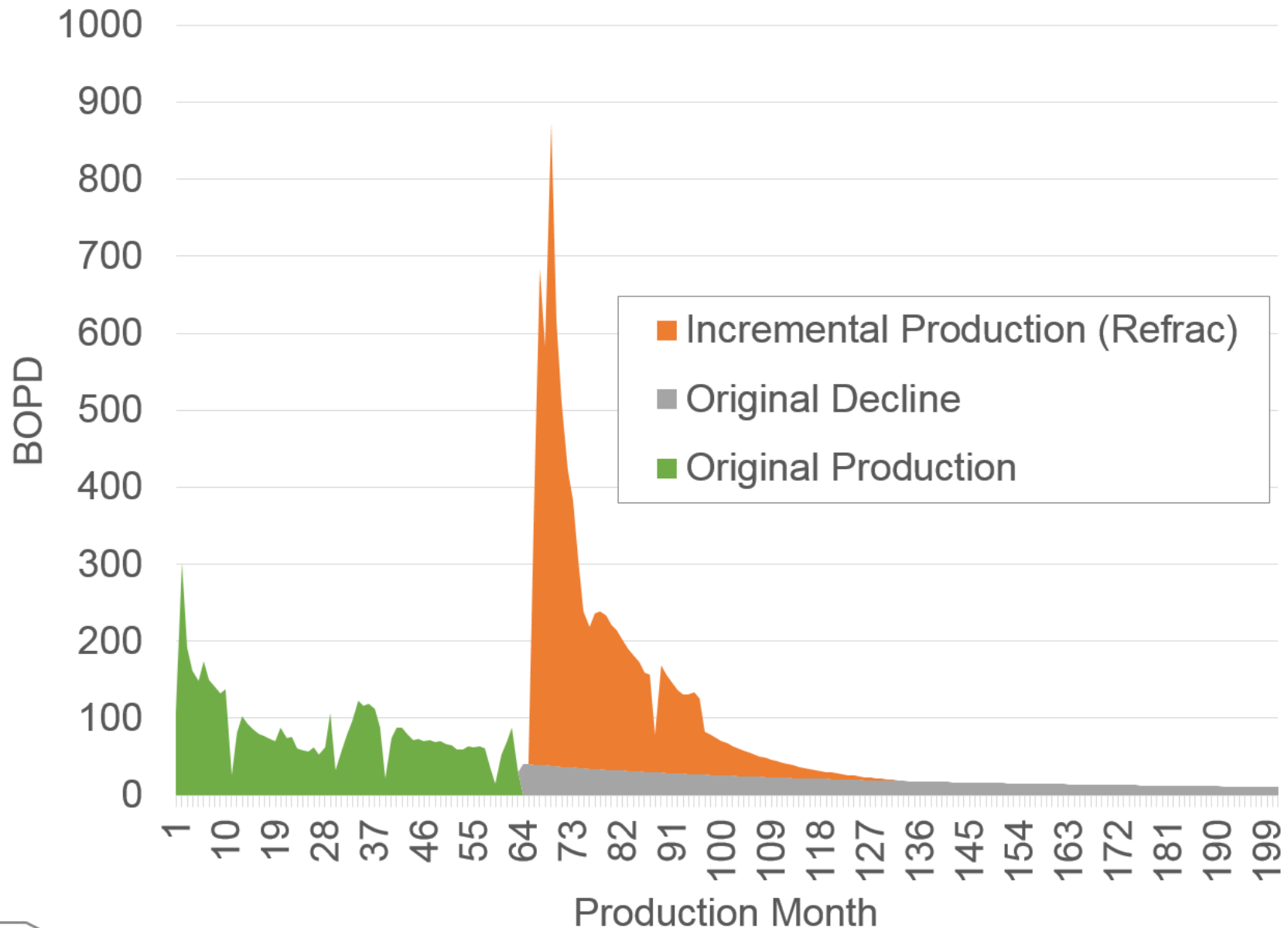
Example: 209,000 BBLS of Incremental Production



Example: 257,000 BBLS of Incremental Production



Example: 253,000 BBLS of Incremental Production



Refrac Candidates

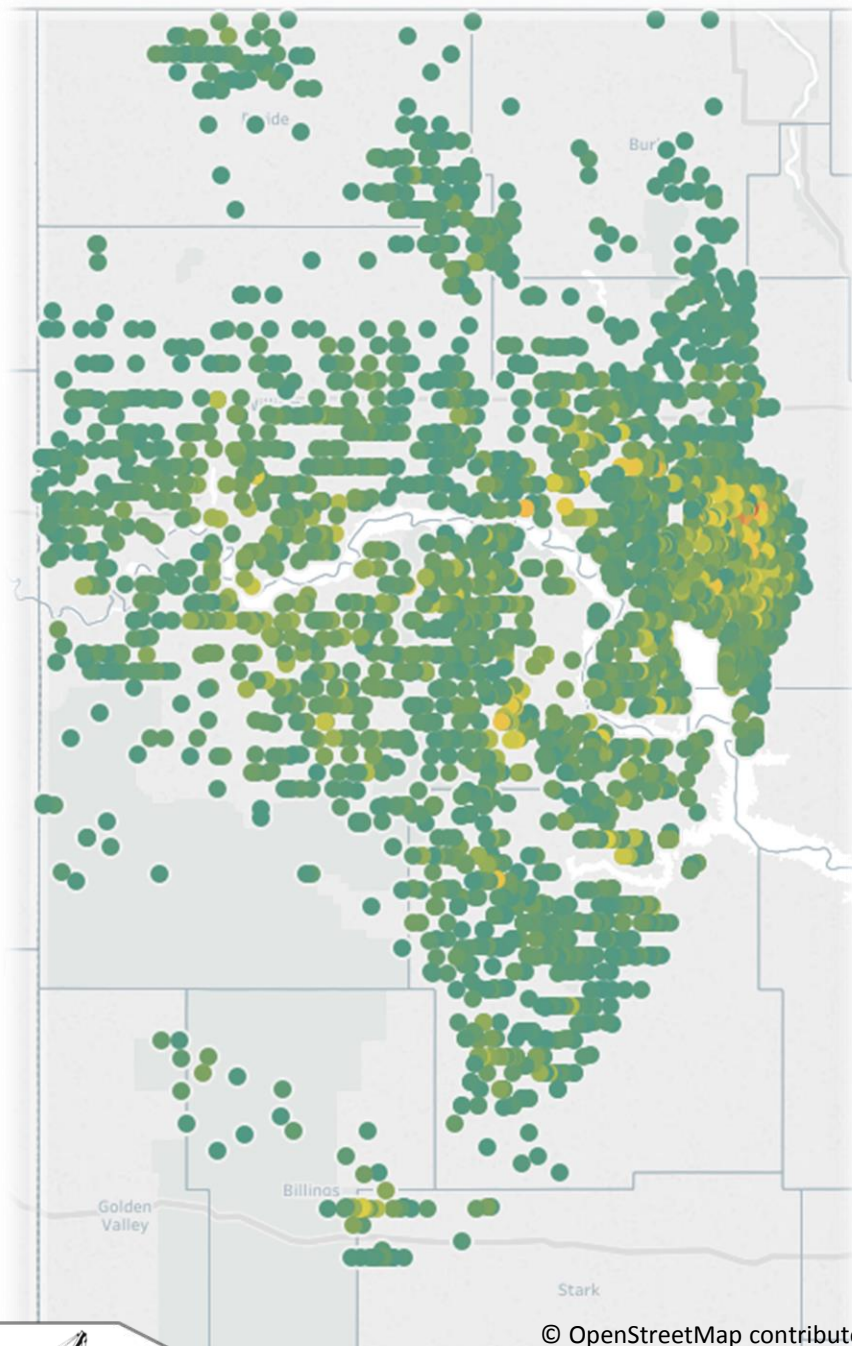
- Refrac selection is based on a number of criteria, many of which are not available in the public domain
- Refracs have been performed with success on a wide range of well ages and performance
- Refracs are designed to address one or more reservoir level issues impacting well performance (e.g. scaling, embedment, proppant rearrangement, fines generation, etc)
- The following work is not intended to imply a well will be refraced, but rather that the wells fit a certain criteria that may make them a near term candidate for refrac.



Peak Month Minimum 200 BOPD

3,074 BKN Wells
Spud 2007-2011

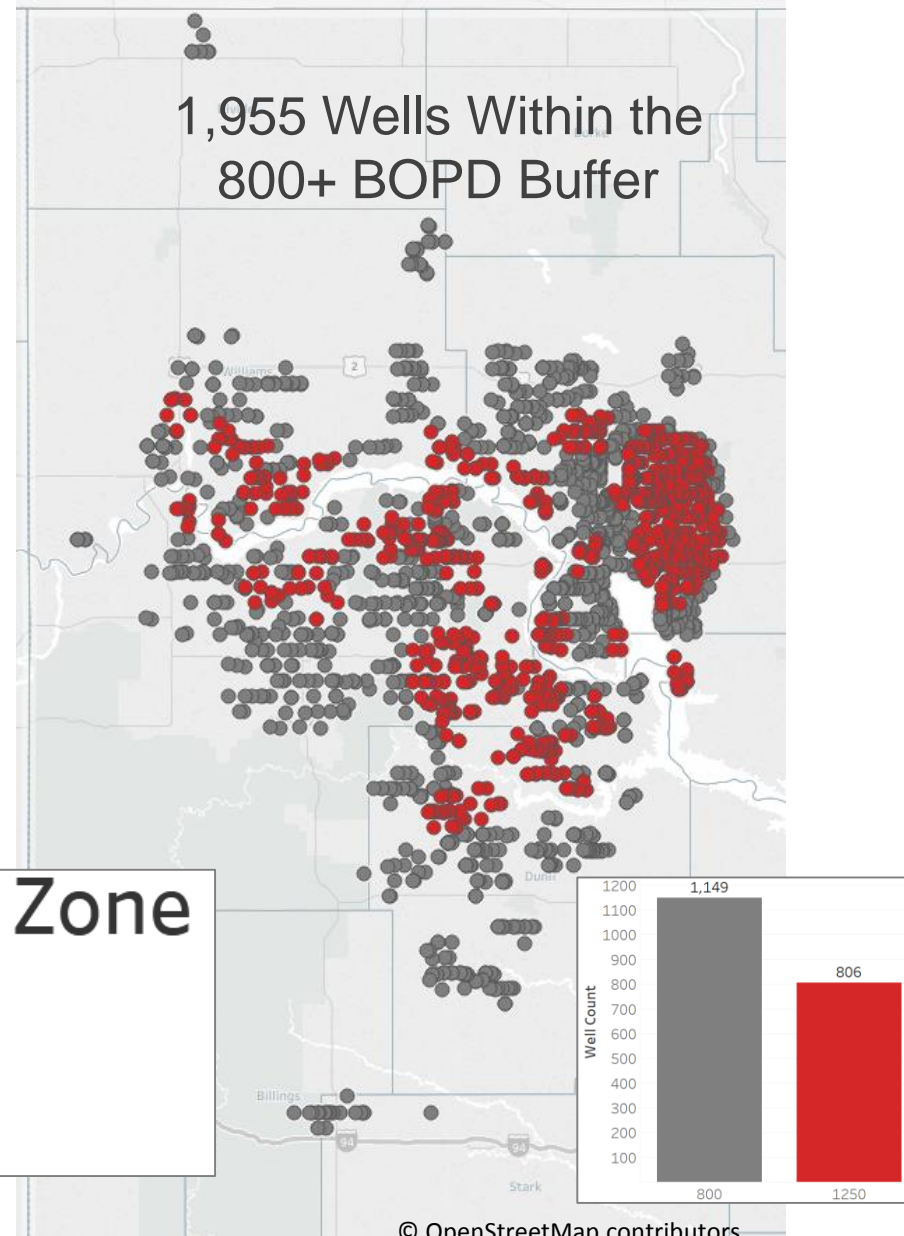
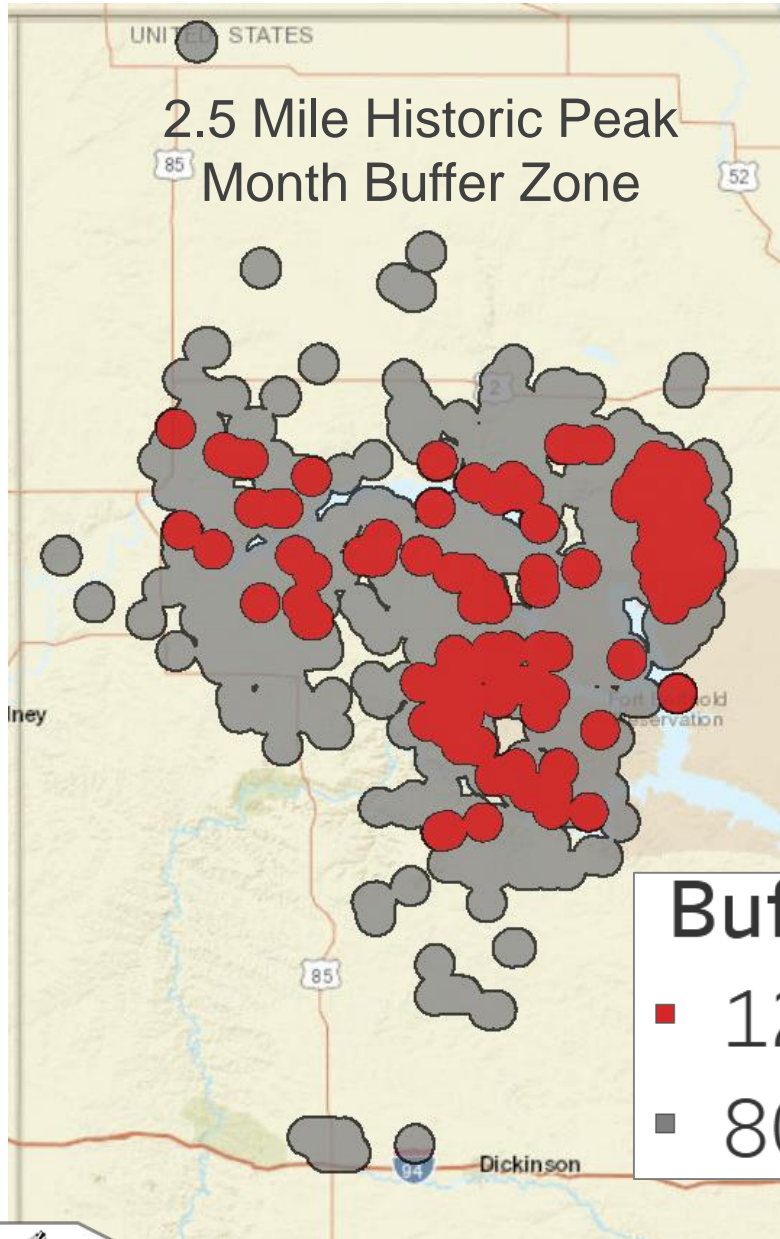
Potential Near term
Refrac Candidates?



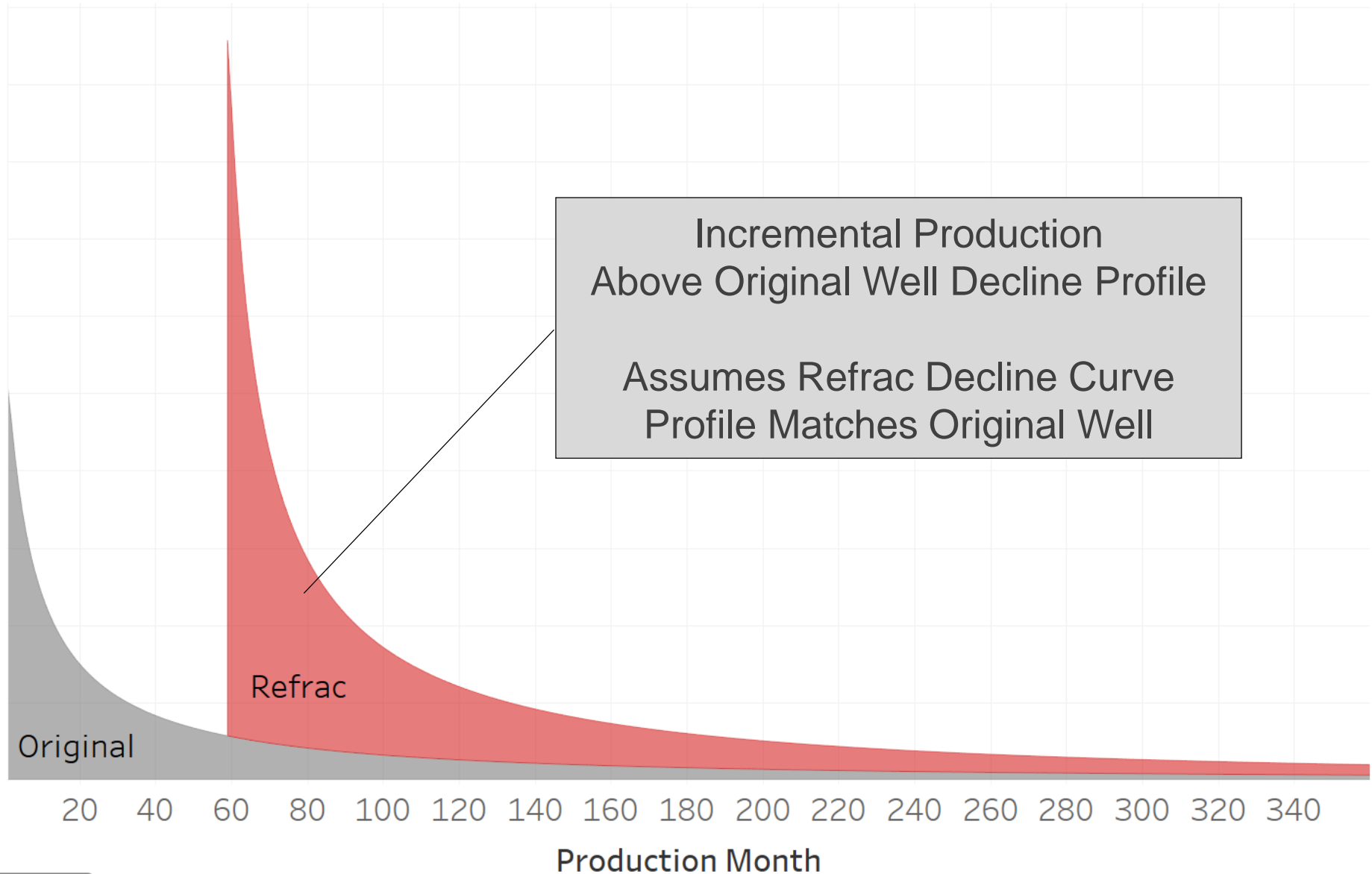
© OpenStreetMap contributors



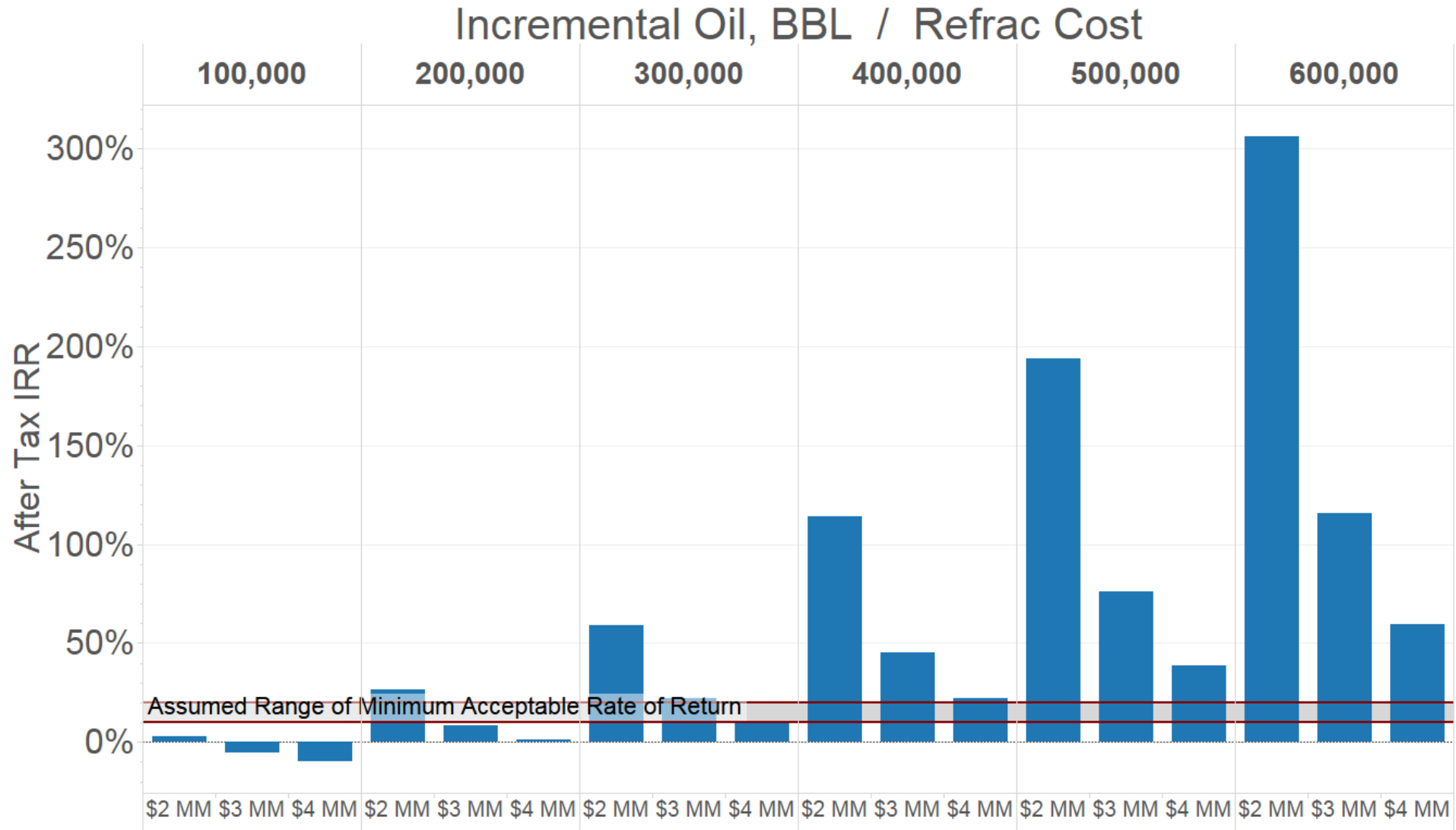
Proximity to High Performing Wells



Refrac Economics Methodology

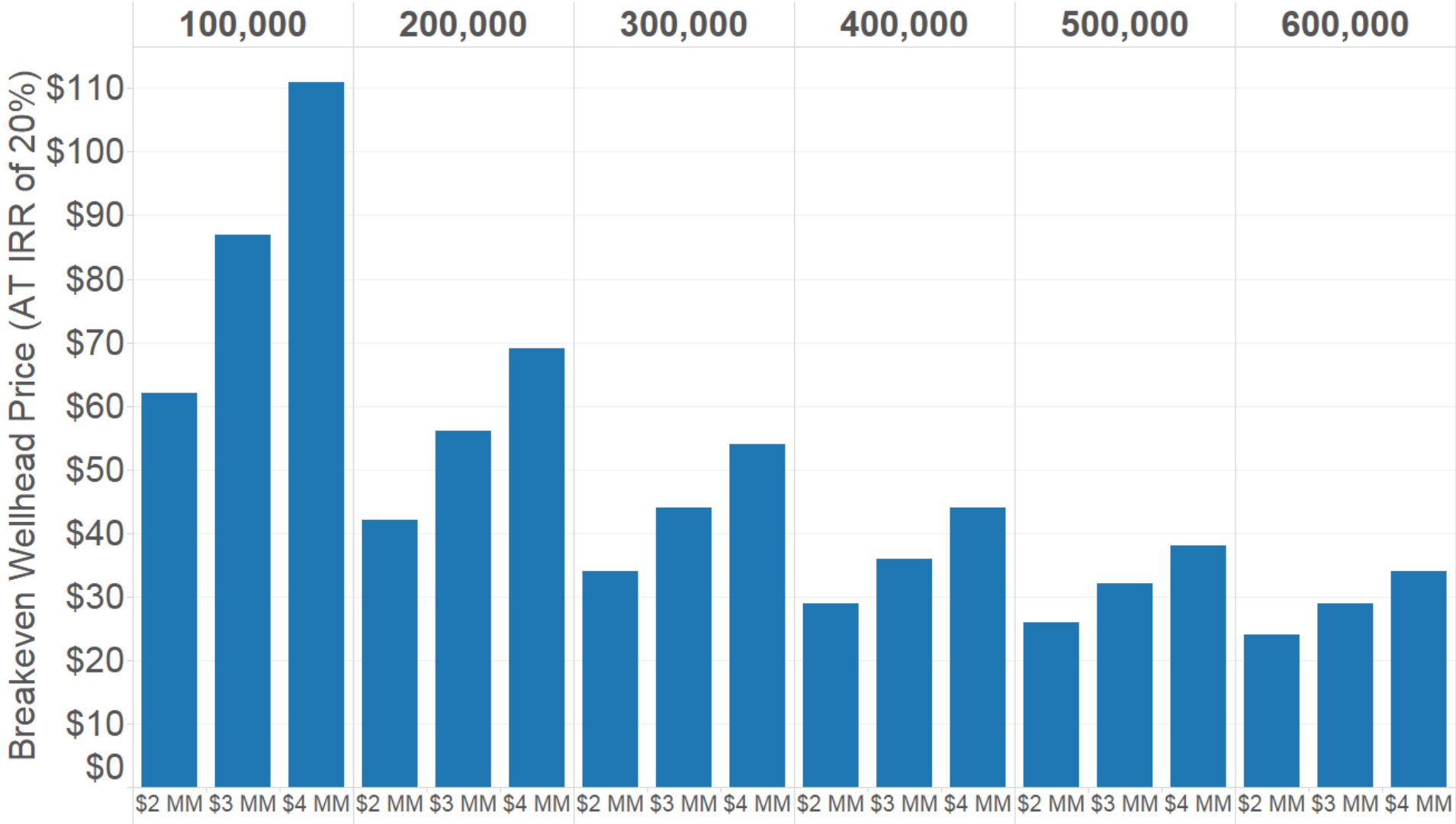


Refrac Summary of \$45 Wellhead Oil



Refrac Breakeven Summary

Incremental Oil, BBL / Refrac Cost



Contact Information

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www.northdakotapipelines.com



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