

North Dakota Pipeline Development

Justin J. Kringstad

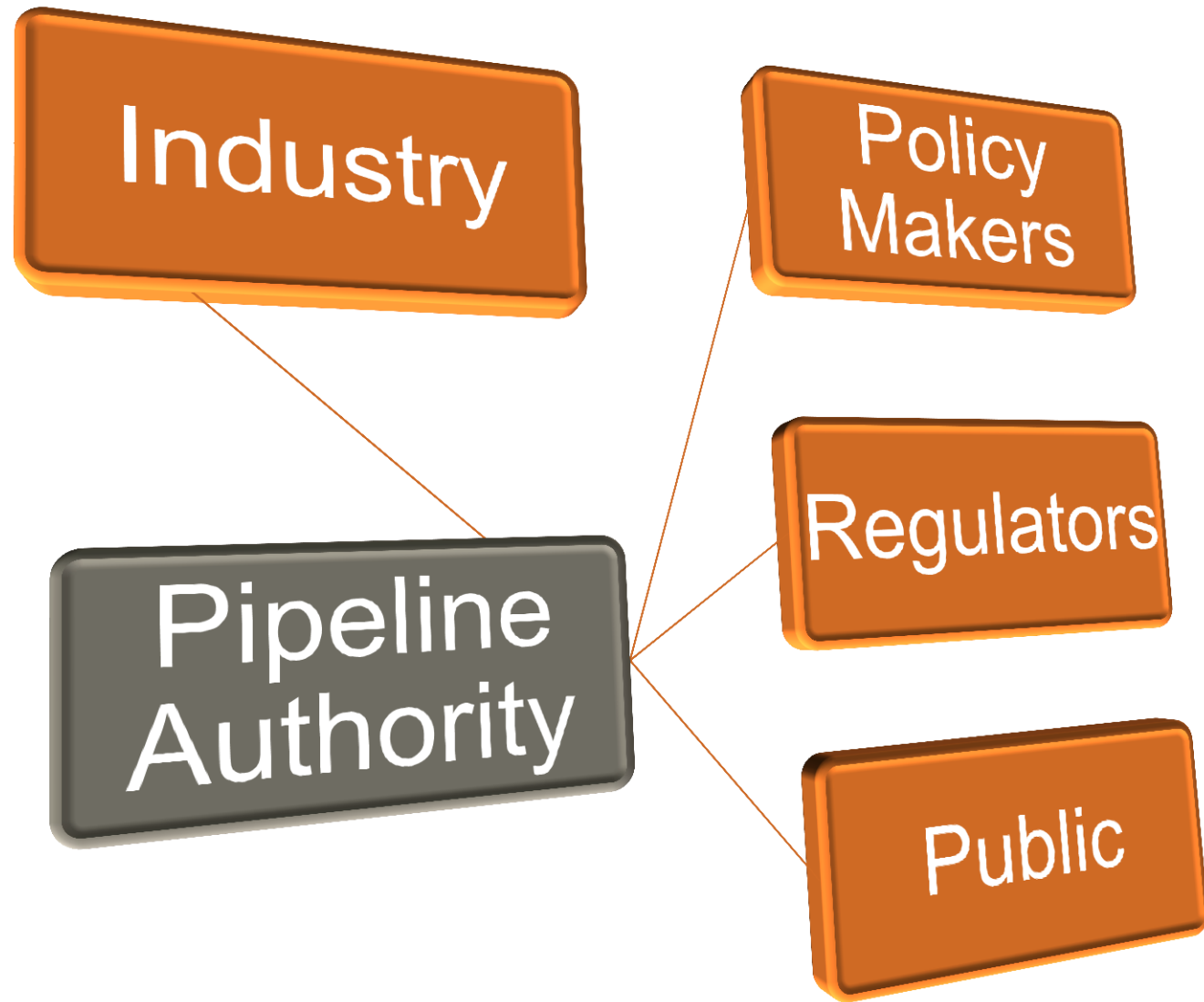
Geological Engineer

Director

North Dakota Pipeline Authority



December 2, 2019



“The roads they traveled were generally poor, if they existed at all. Weather sometimes made even the shortest passage from the wellhead impossible. A dilemma arose concerning what to do with the blessedly continuous production of oil when the roads became hopelessly mired.”

It's 1860's Pennsylvania!

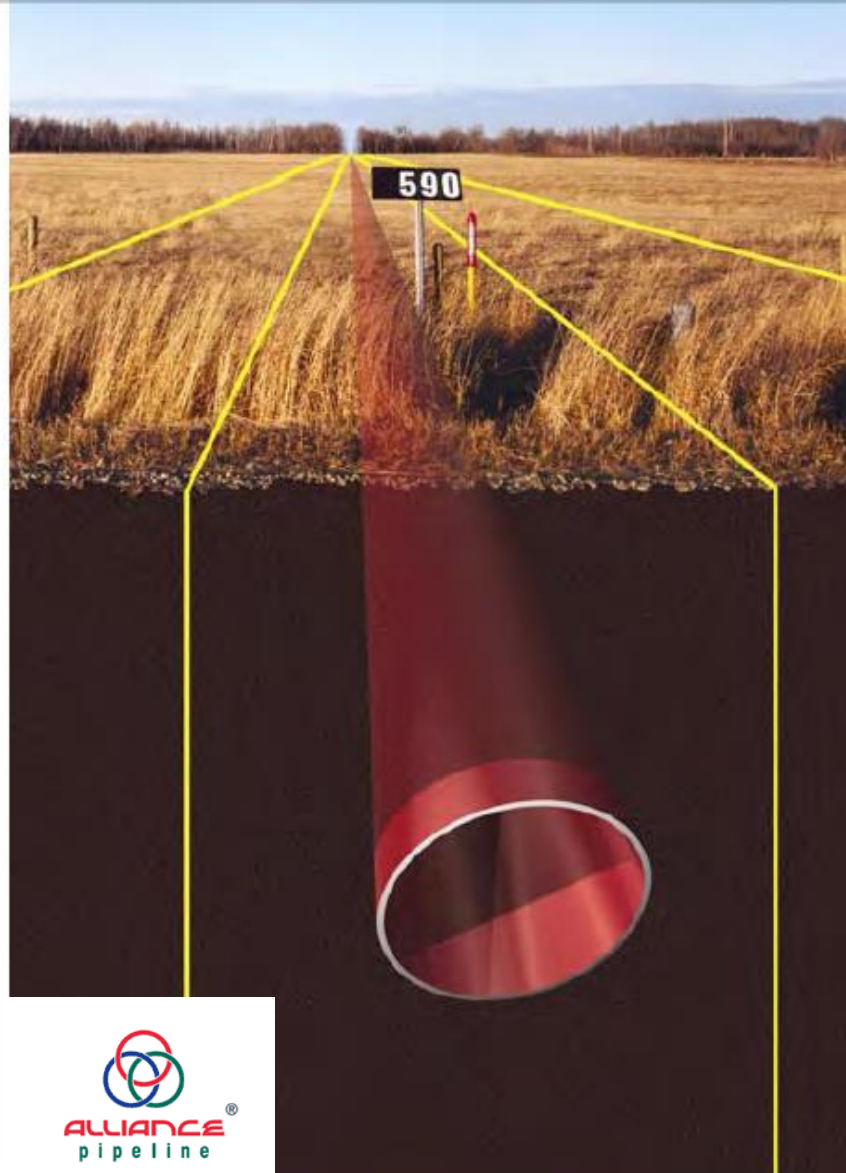
Excerpt from: Oil & Gas Pipelines in Nontechnical Language





Source: Bridger Pipeline

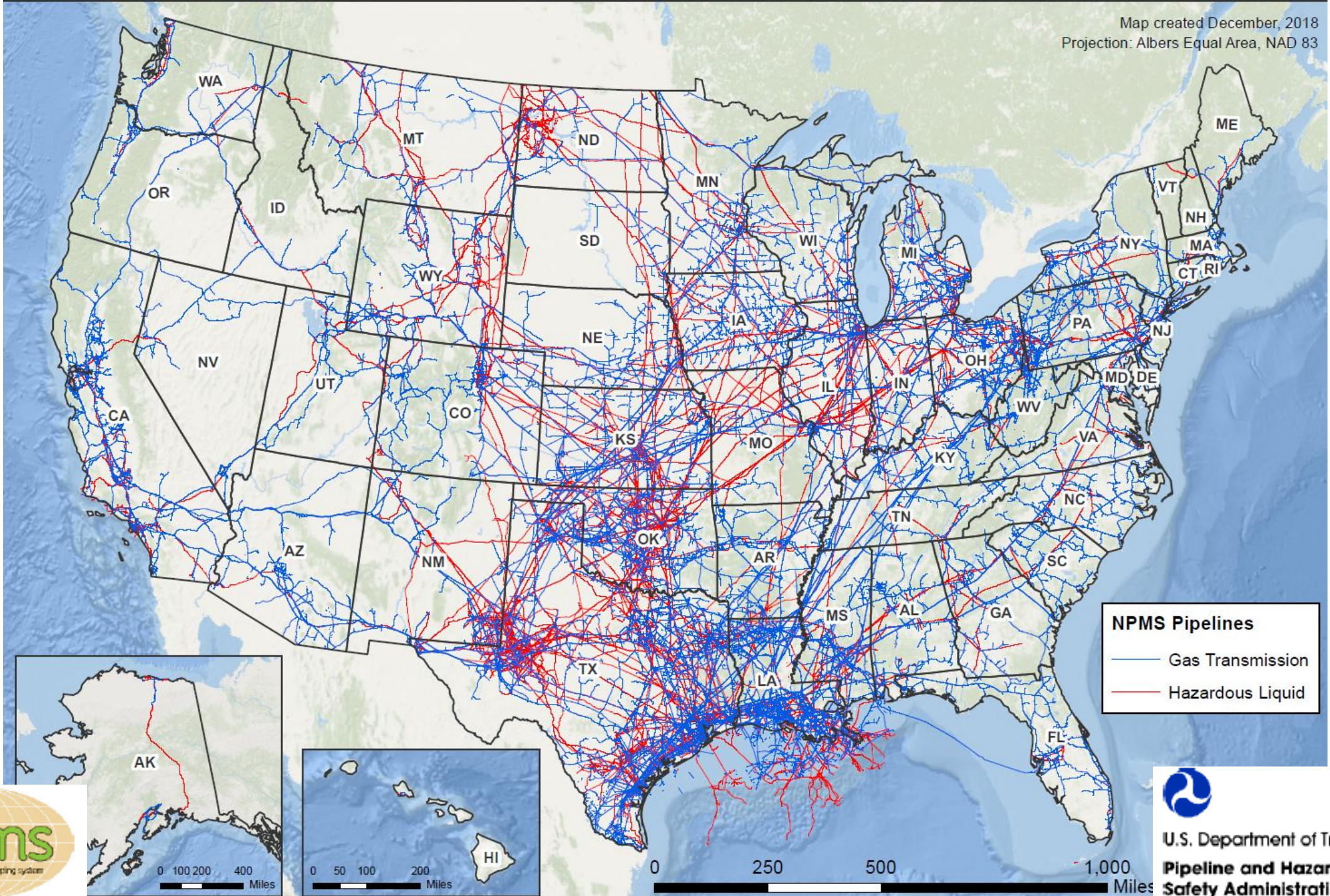
Why Pipelines?



- Safest and most economical way to transport liquid products over large distances.
- The US pipeline infrastructure is crucial to our economy, safety, and living standards.
- Pipelines carry all kinds of products including oil, natural gas, gasoline, diesel, jet fuel, heating oil, carbon dioxide, and water.

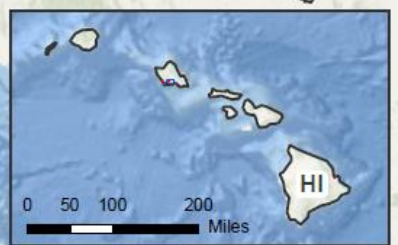
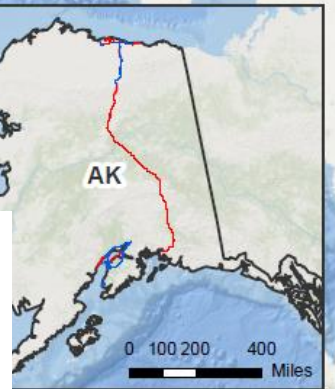
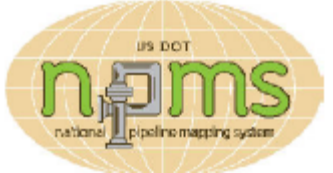
Where are the Pipelines?



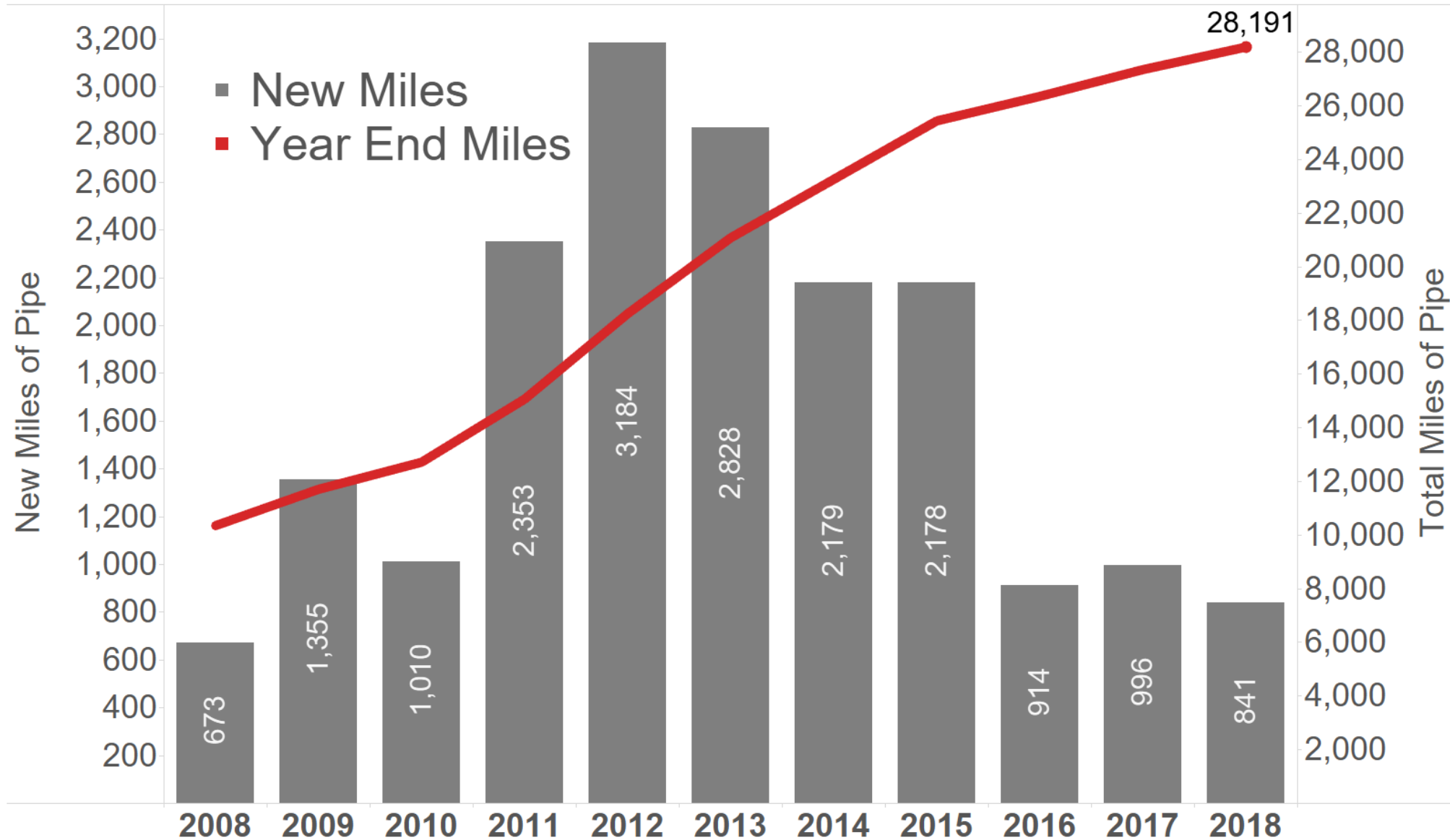


NPMS Pipelines

- Gas Transmission
- Hazardous Liquid



North Dakota Pipeline Construction

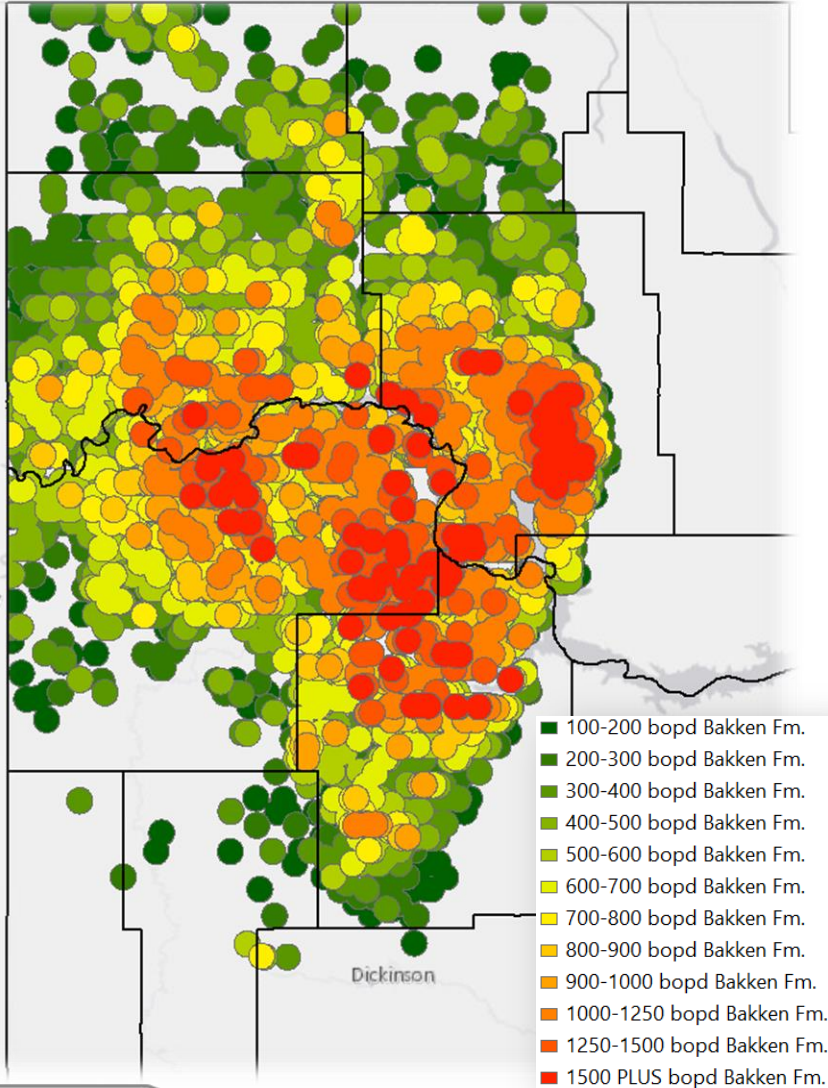


Sources: NDIC & PHMSA

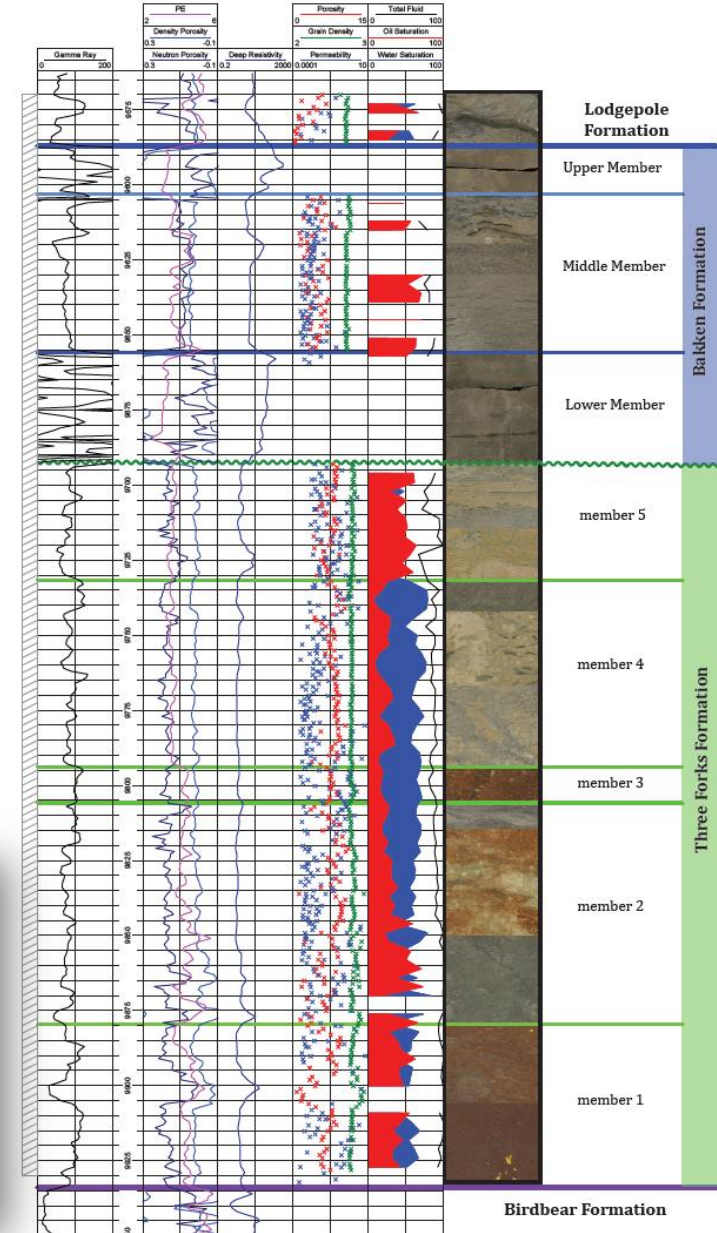
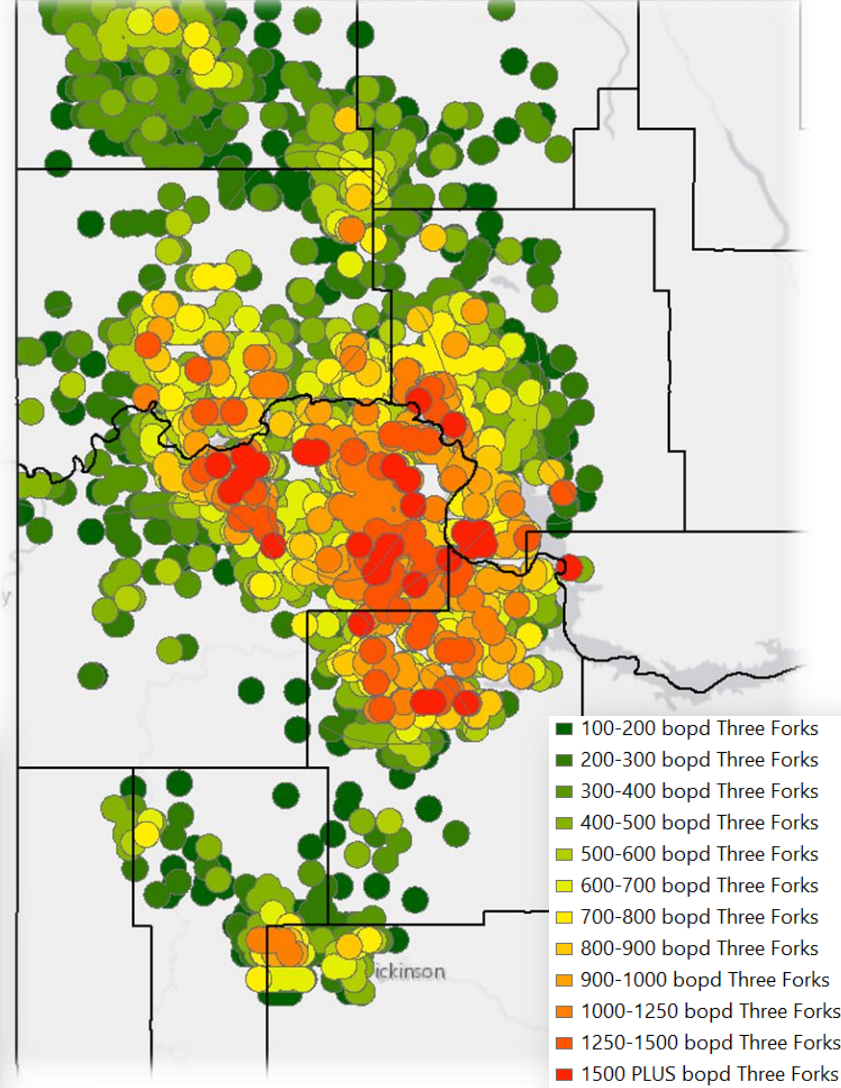


Bakken & Three Forks Formations

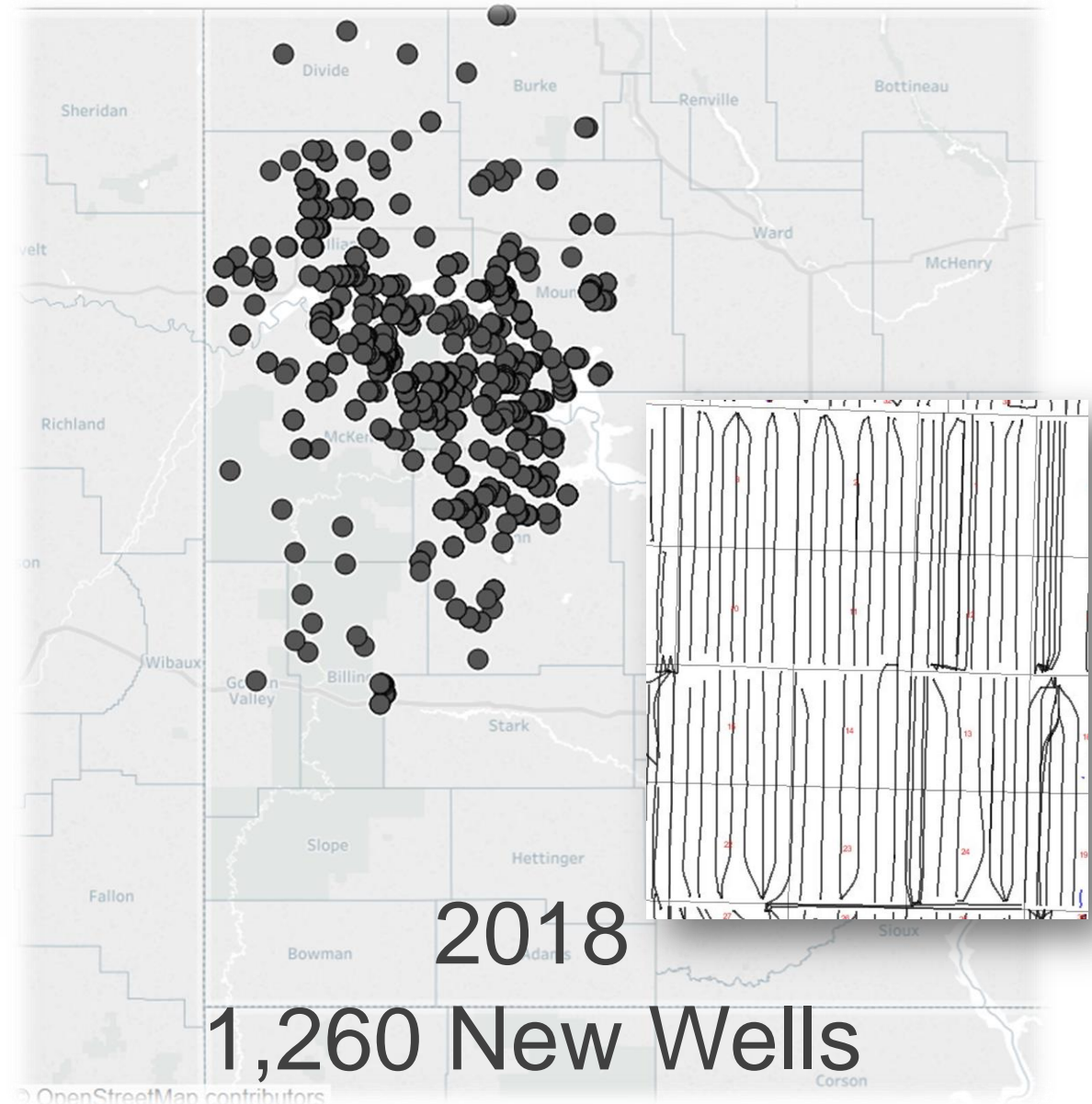
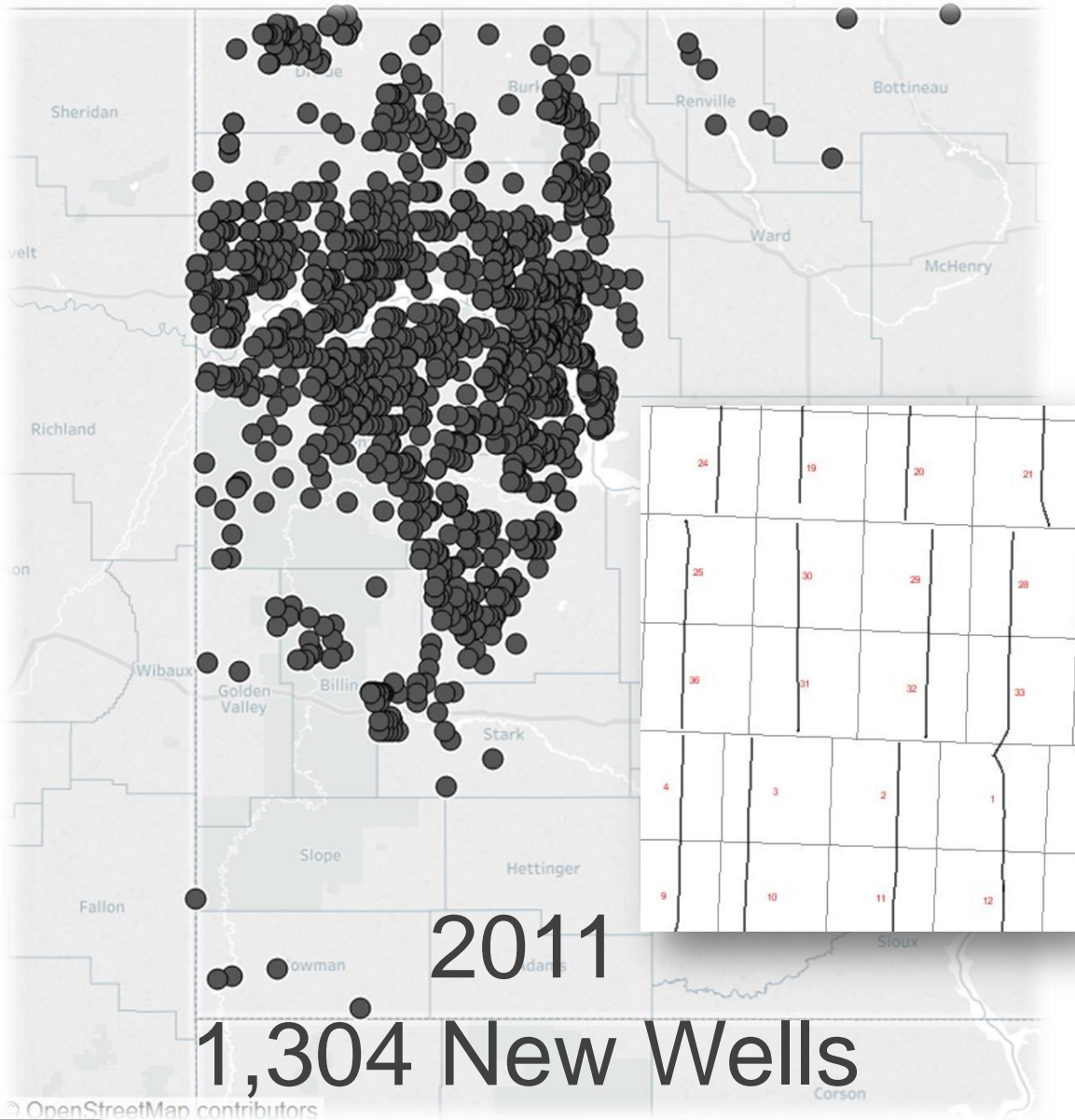
Bakken Formation



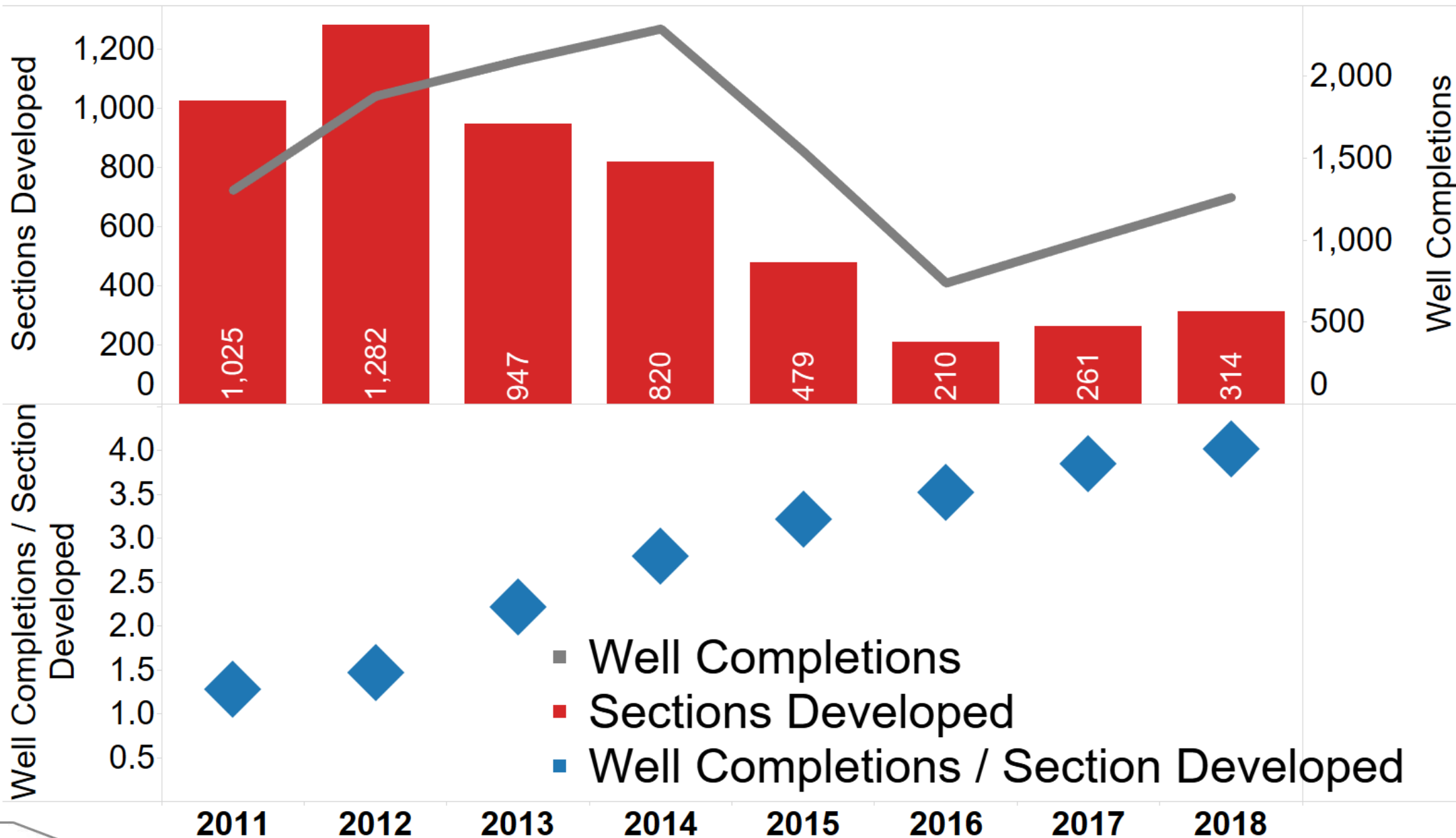
Three Forks Formation



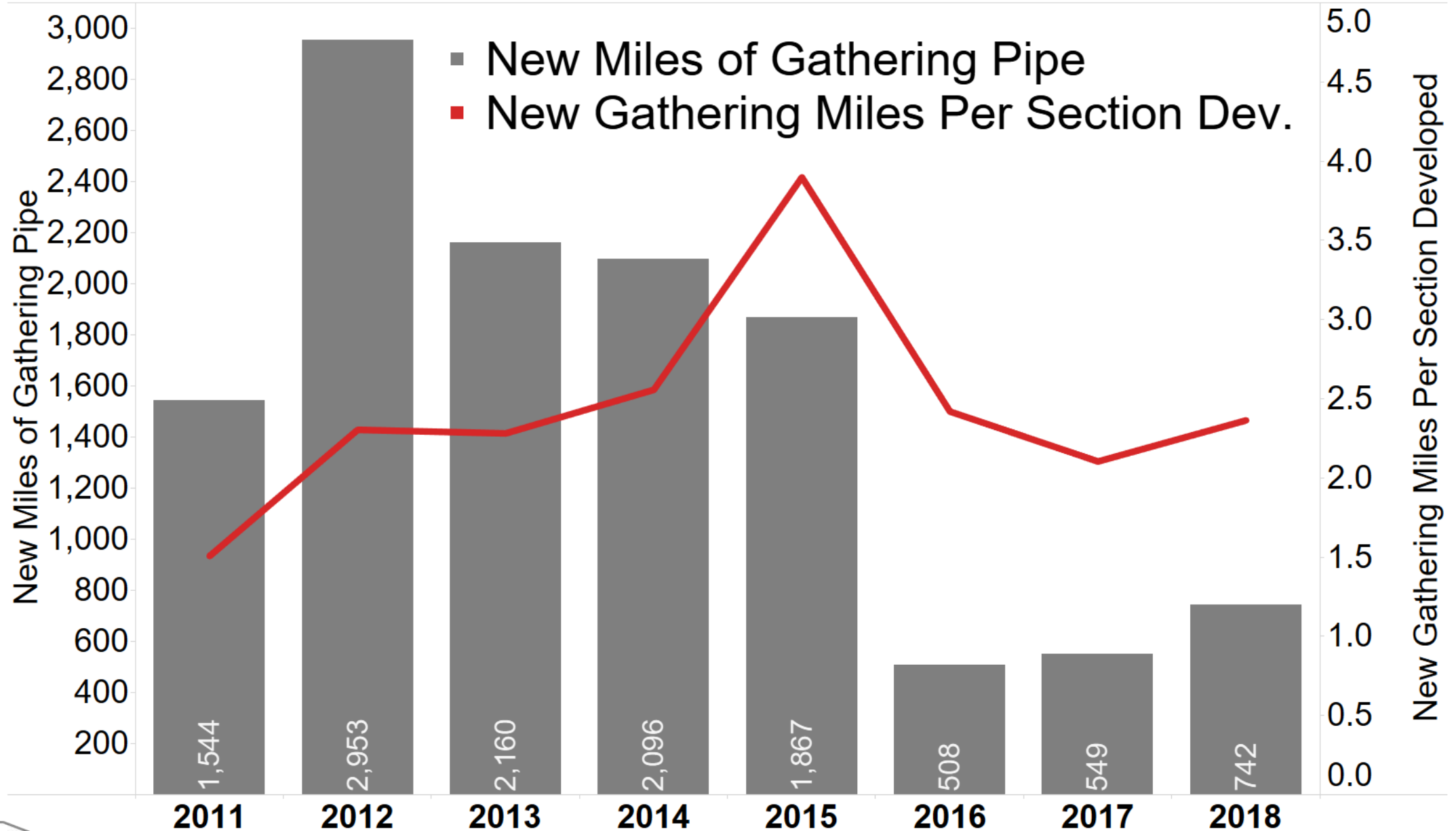
North Dakota Well Completions and Spatial Development



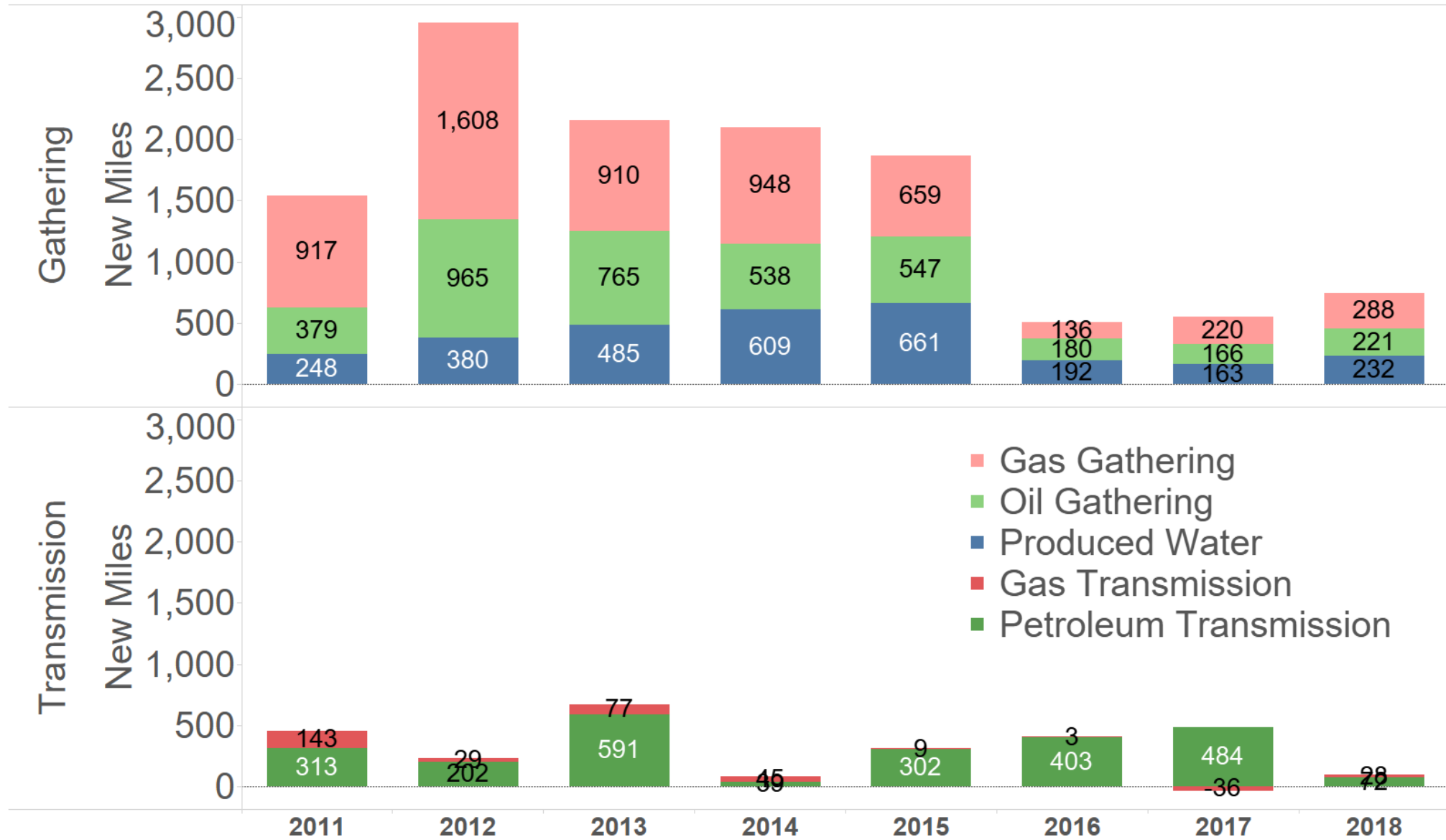
North Dakota Well Completions and Developed Sections



North Dakota Gathering Pipeline Development



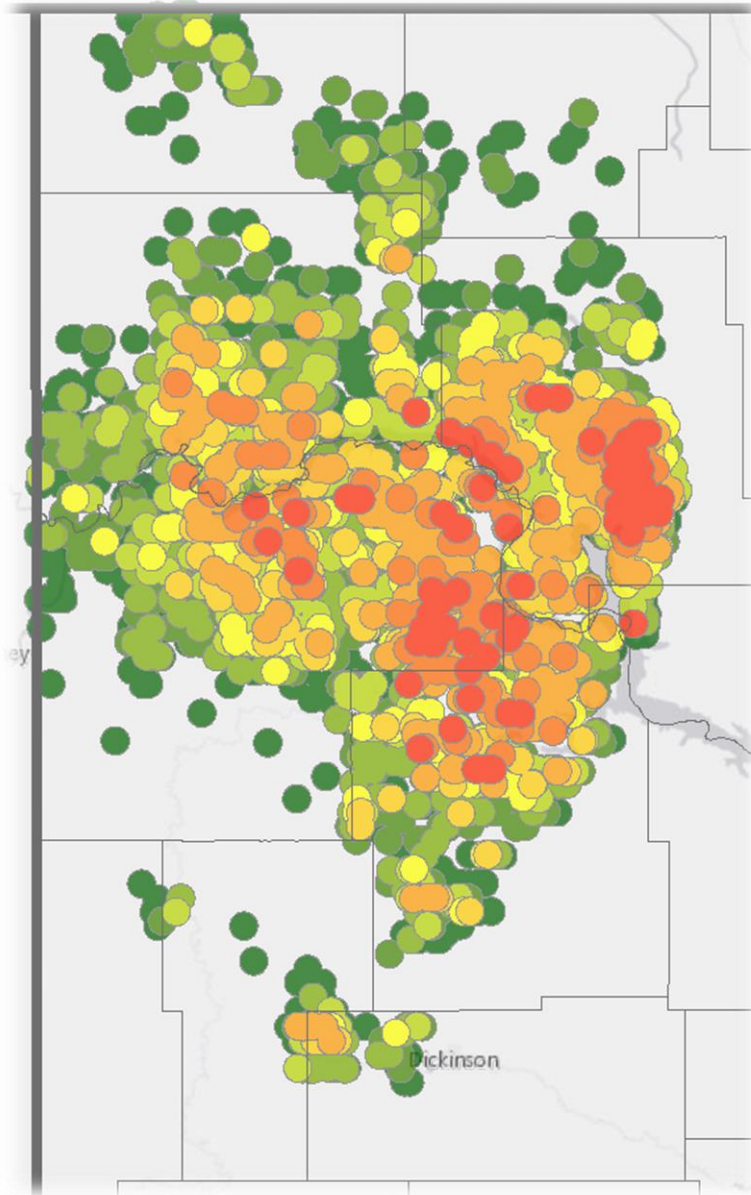
North Dakota Pipeline Construction



Sources: NDIC & PHMSA



Bakken Breakeven Price Range (20% IRR)



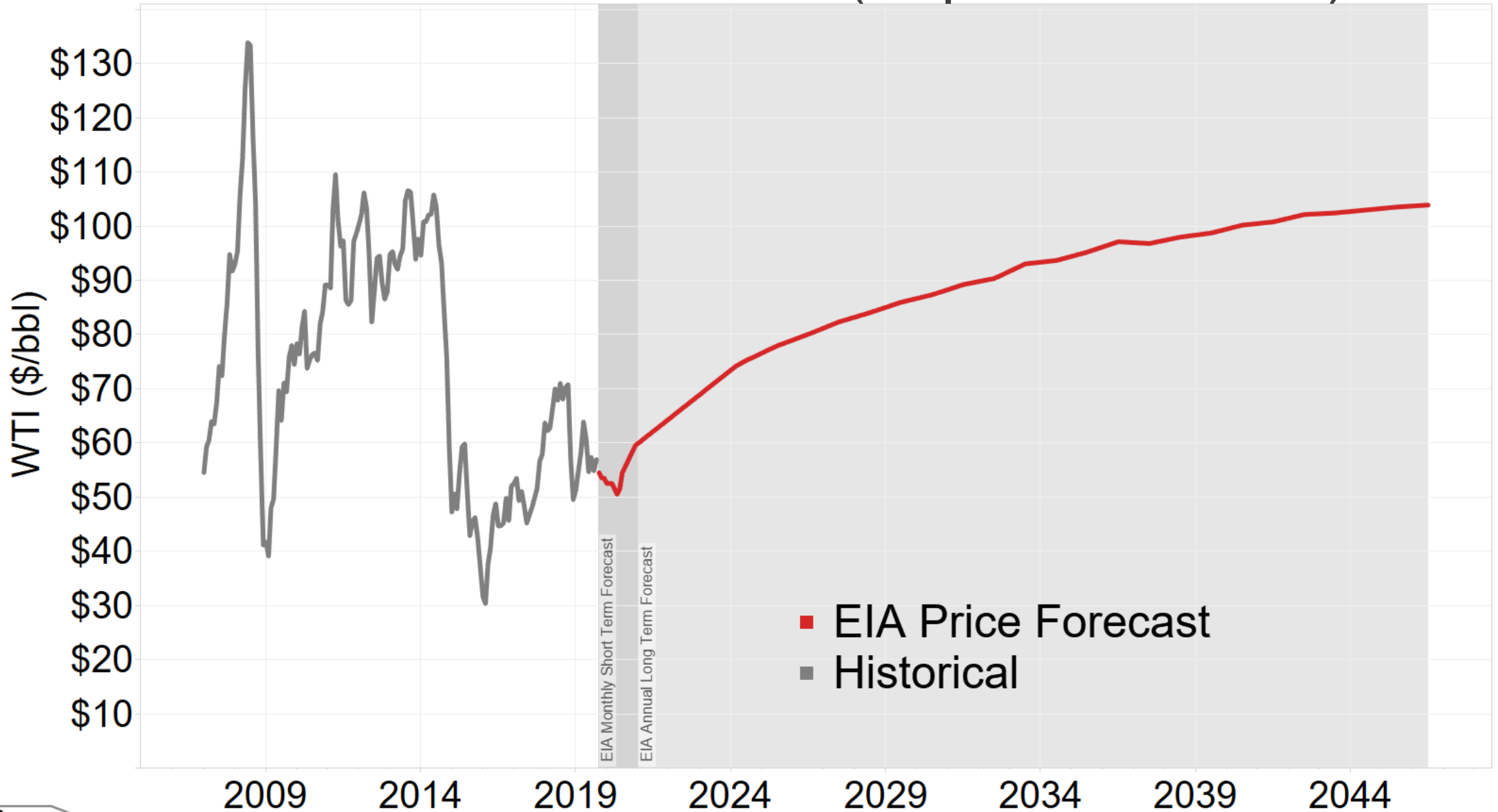
Bakken Breakeven Prices
\$6 - \$8 Million
Completed Wells Cost

- \$58-\$73
- \$49-\$61
- \$43-\$52
- \$39-\$48
- \$36-\$43
- \$34-\$40
- \$32-\$38
- \$28-\$33
- \$26-\$30

Background Map: Esri, HERE, DeLorme, MapmyIndia, ©
OpenStreetMap contributors, and the GIS user community

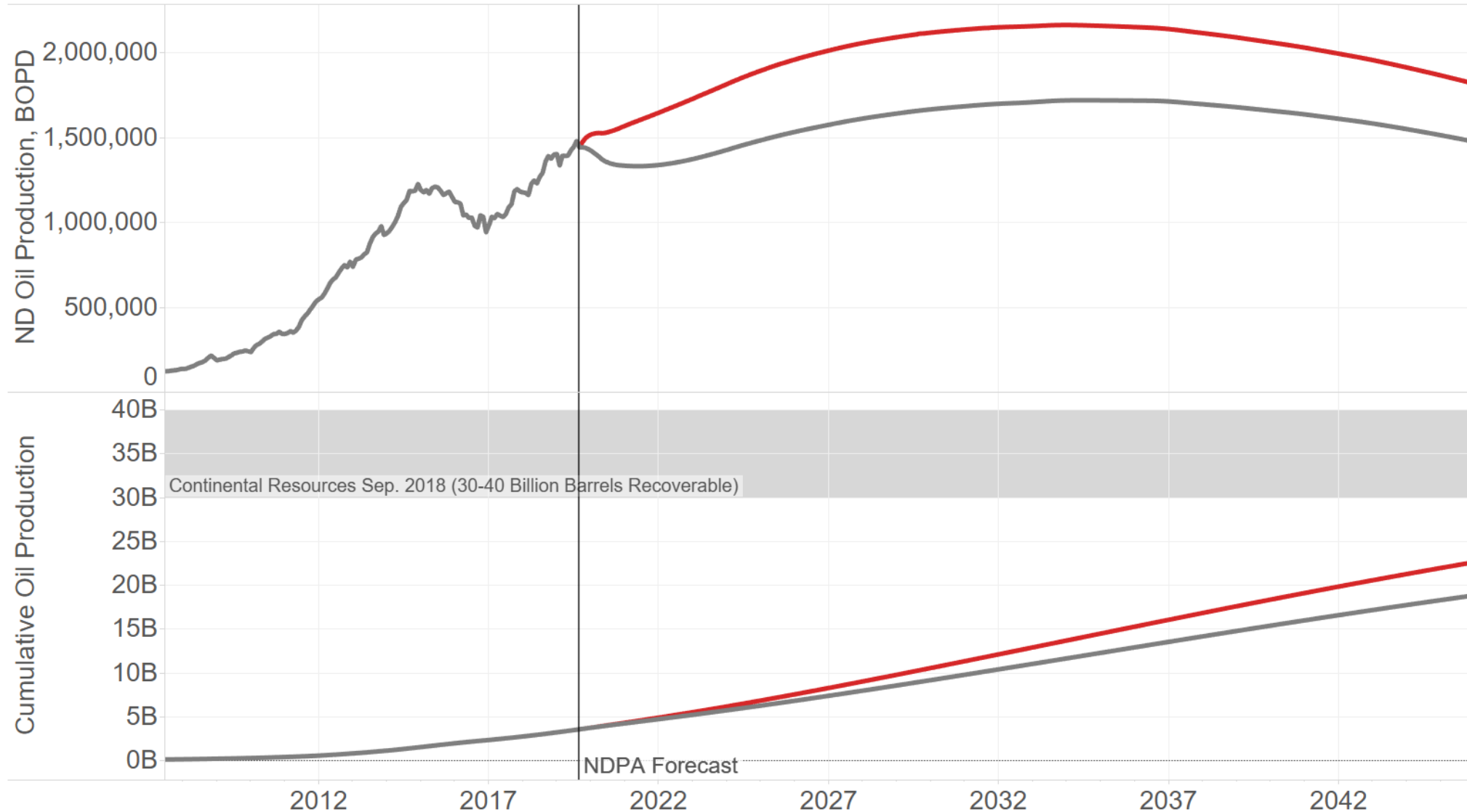


EIA Forecasted Oil Price (September 2019)

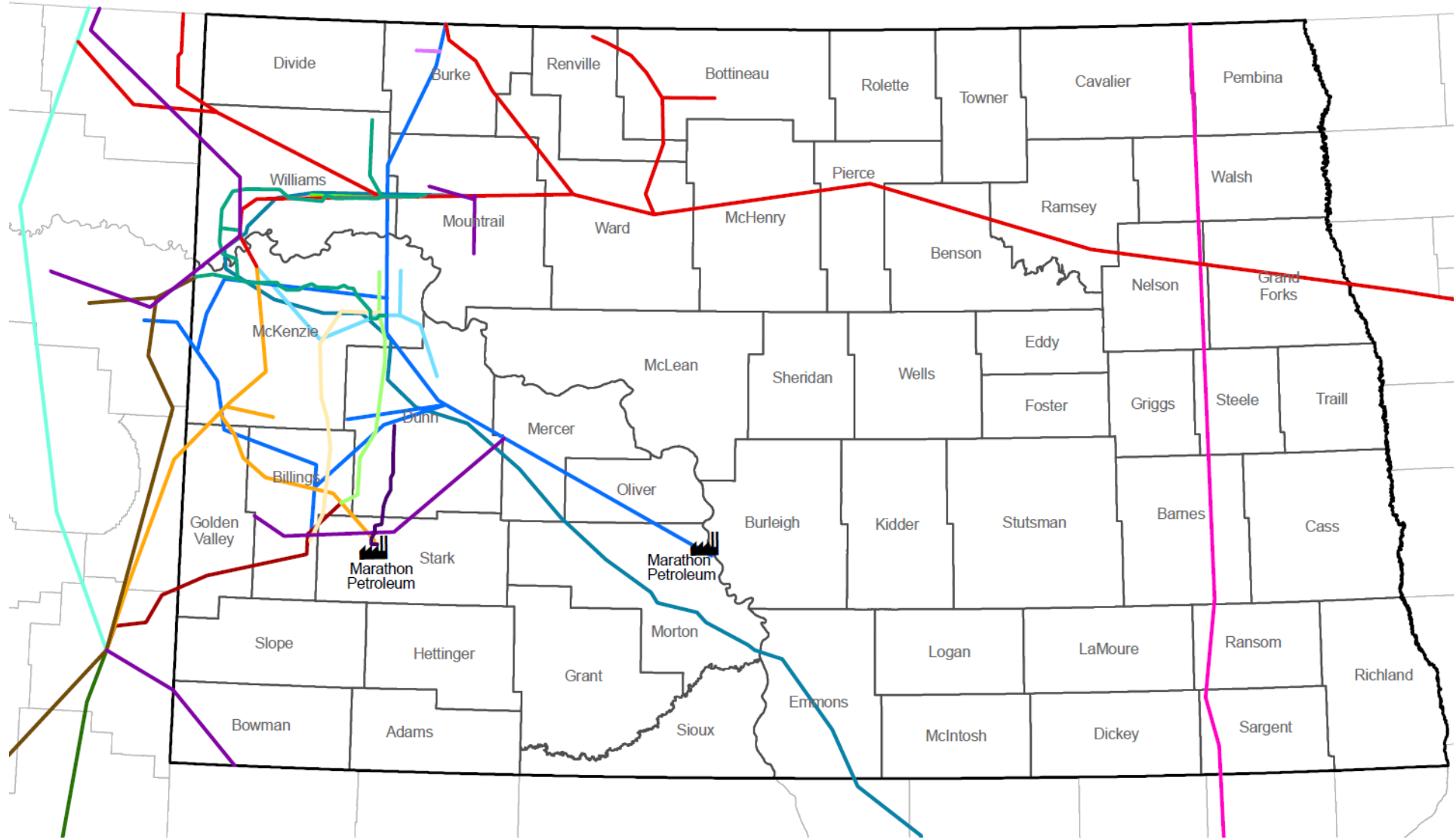


North Dakota Oil Production Forecast

Assumes Current Technology – Enhanced Oil Recovery Not Included



North Dakota Crude Oil Pipelines

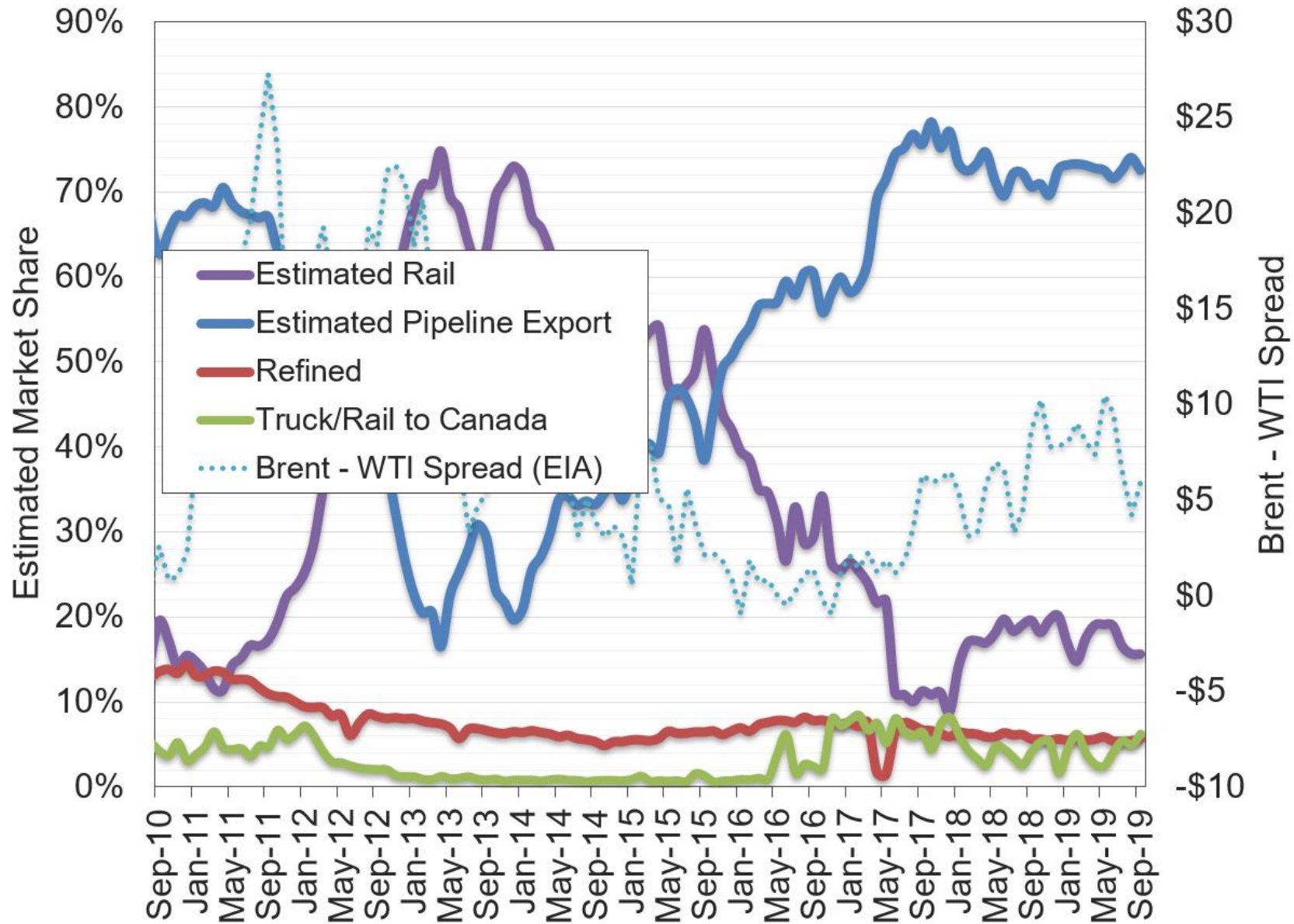


- | | | | | | |
|--------------------|-----------------|---------------|------------|-------------------|----------|
| Refinery | Basin Transload | Butte | Double H | Hiland | Bridger |
| Bakken Oil Express | Belle Fourche | Crestwood | Enbridge | Keystone Pipeline | Targa |
| BakkenLink | Bridger | Dakota Access | Four Bears | Little Missouri | Marathon |

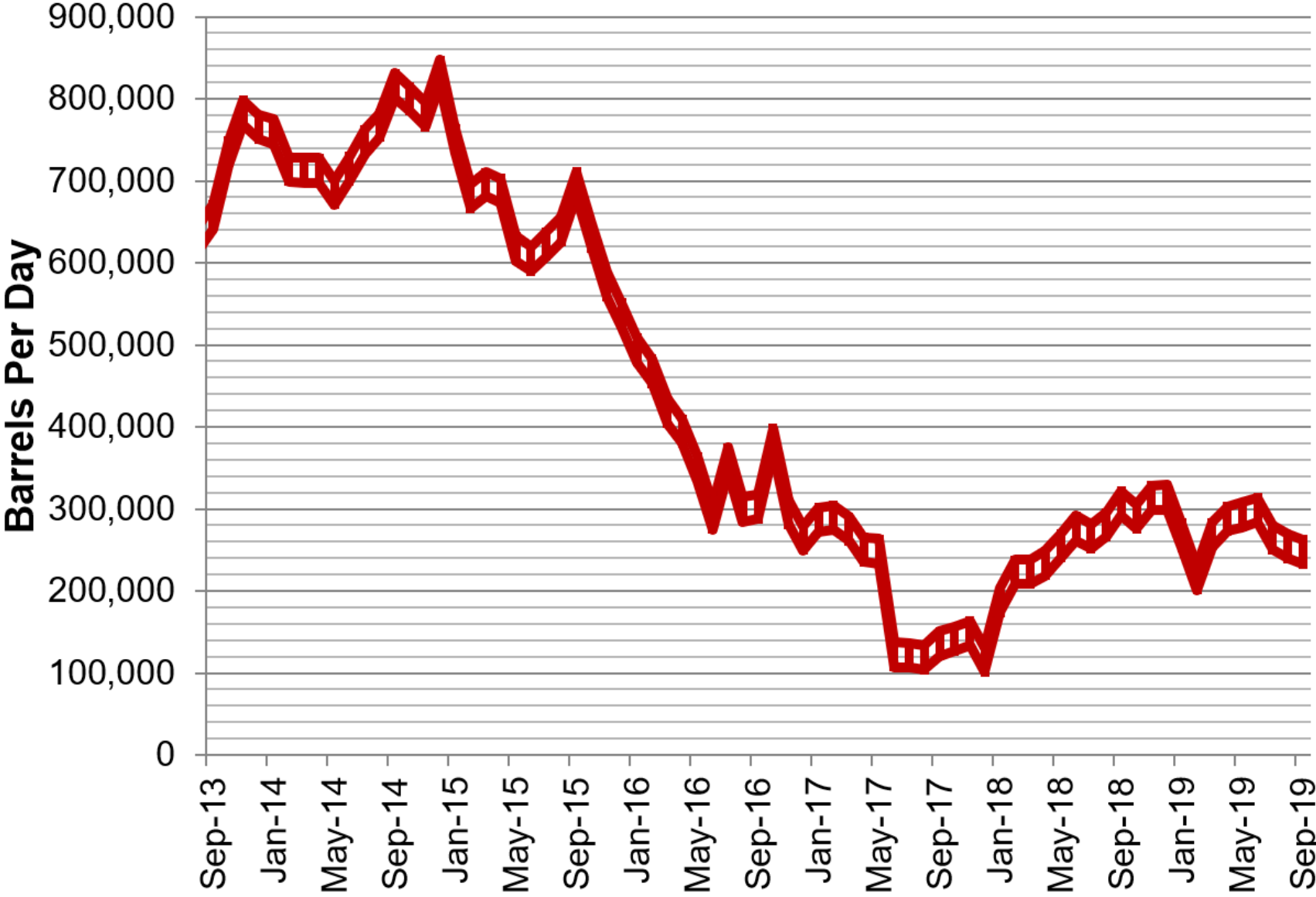
US Refining Markets



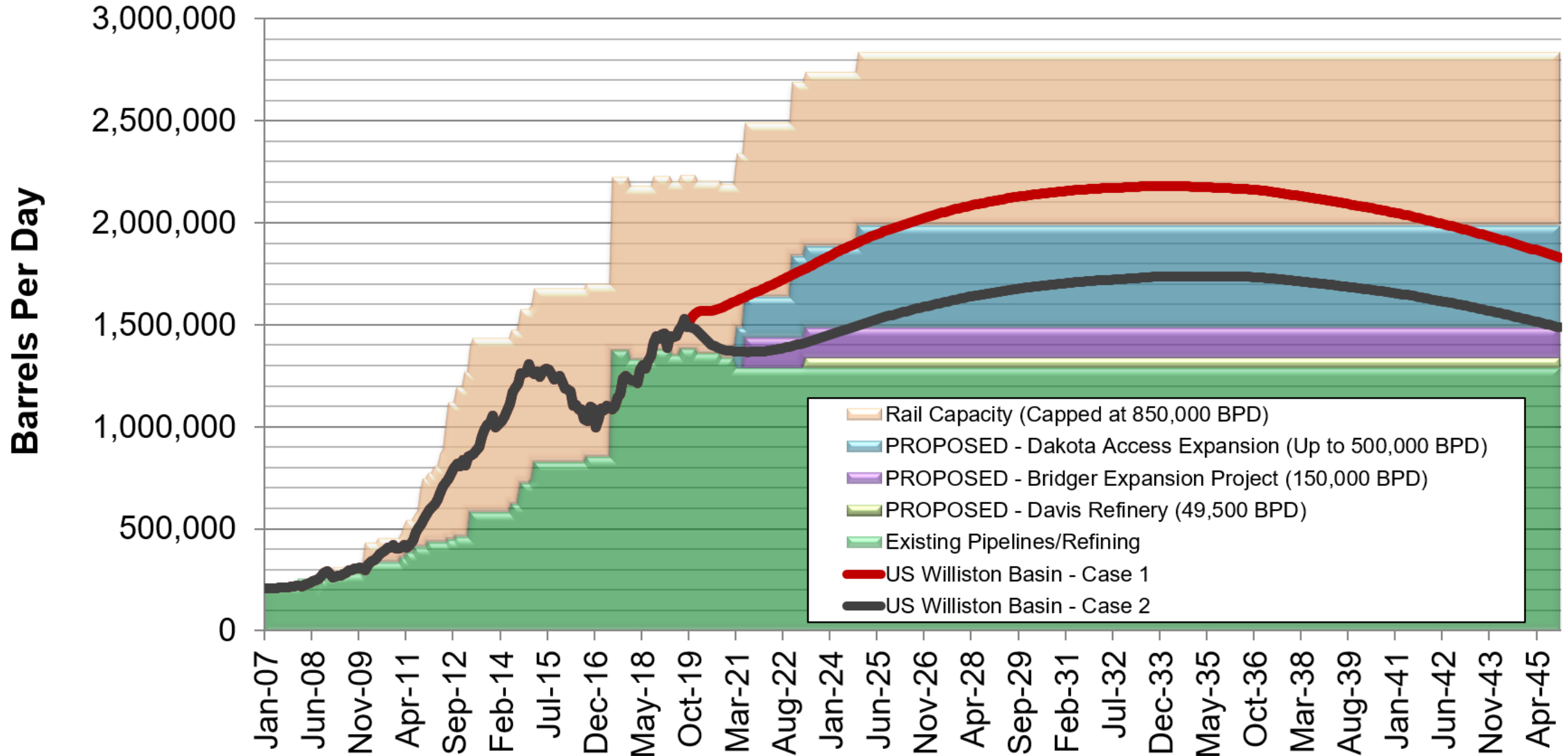
Estimated Williston Basin Oil Transportation



Estimated ND Rail Export Volumes



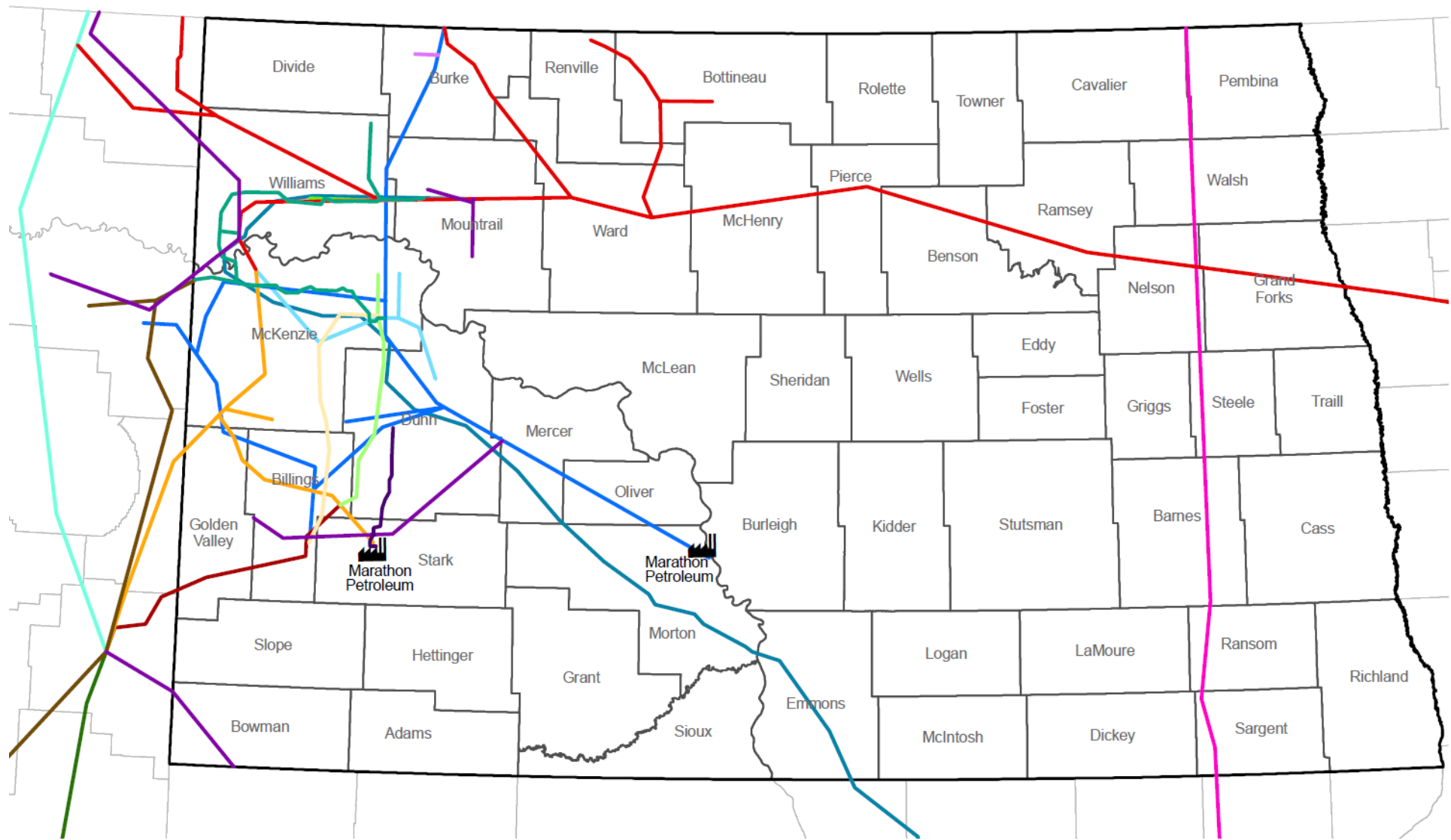
Williston Basin Oil Production & Export Capacity, BOPD





















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

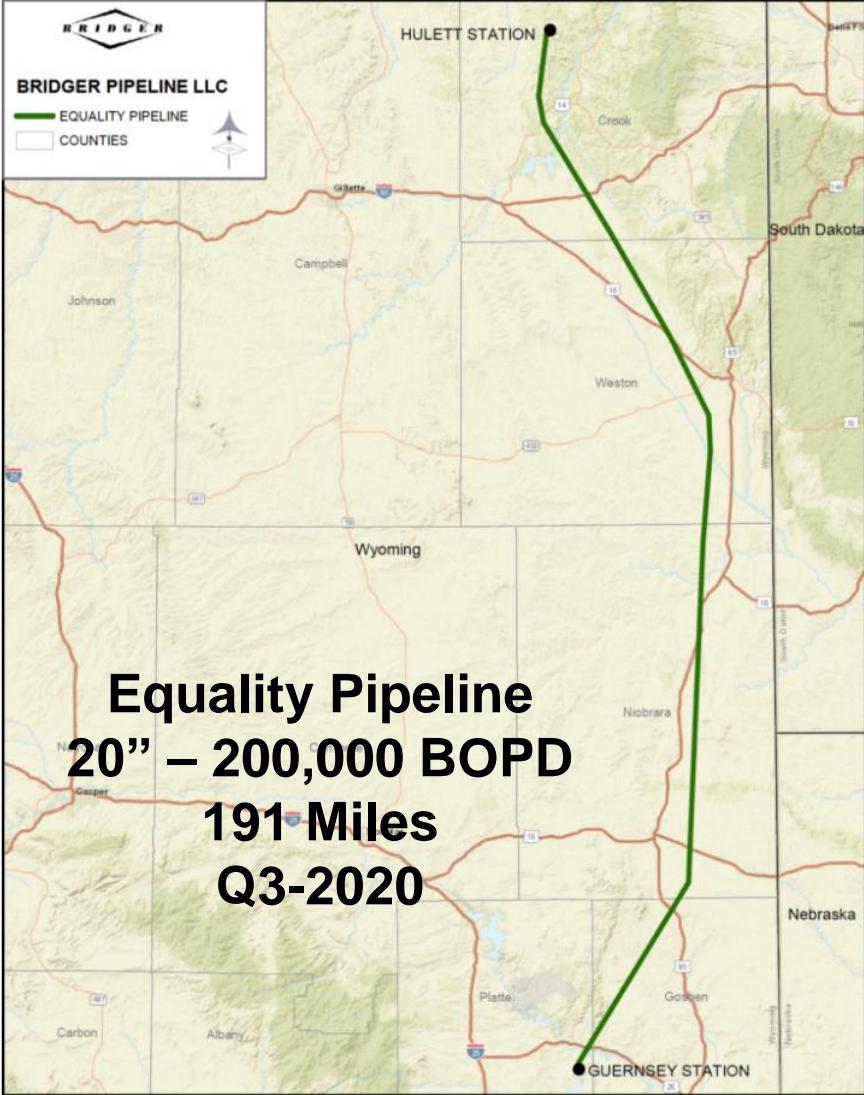
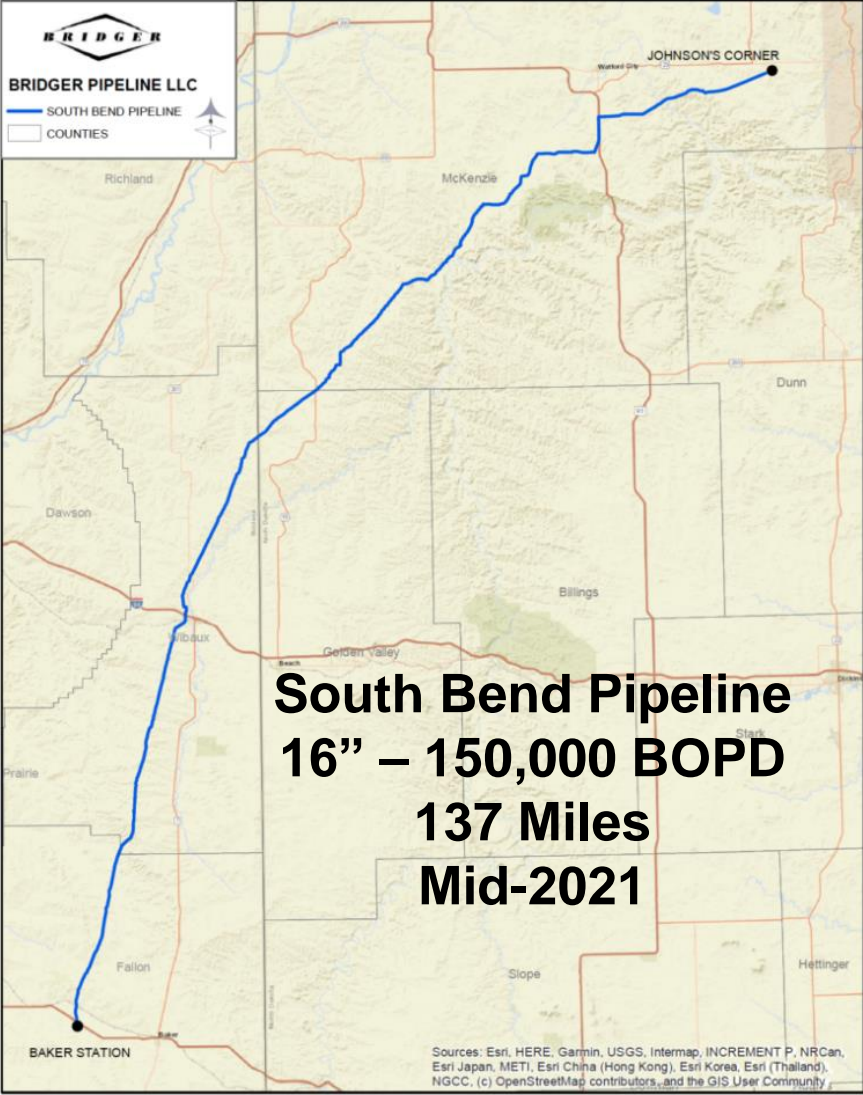


North Dakota Crude Oil Pipelines



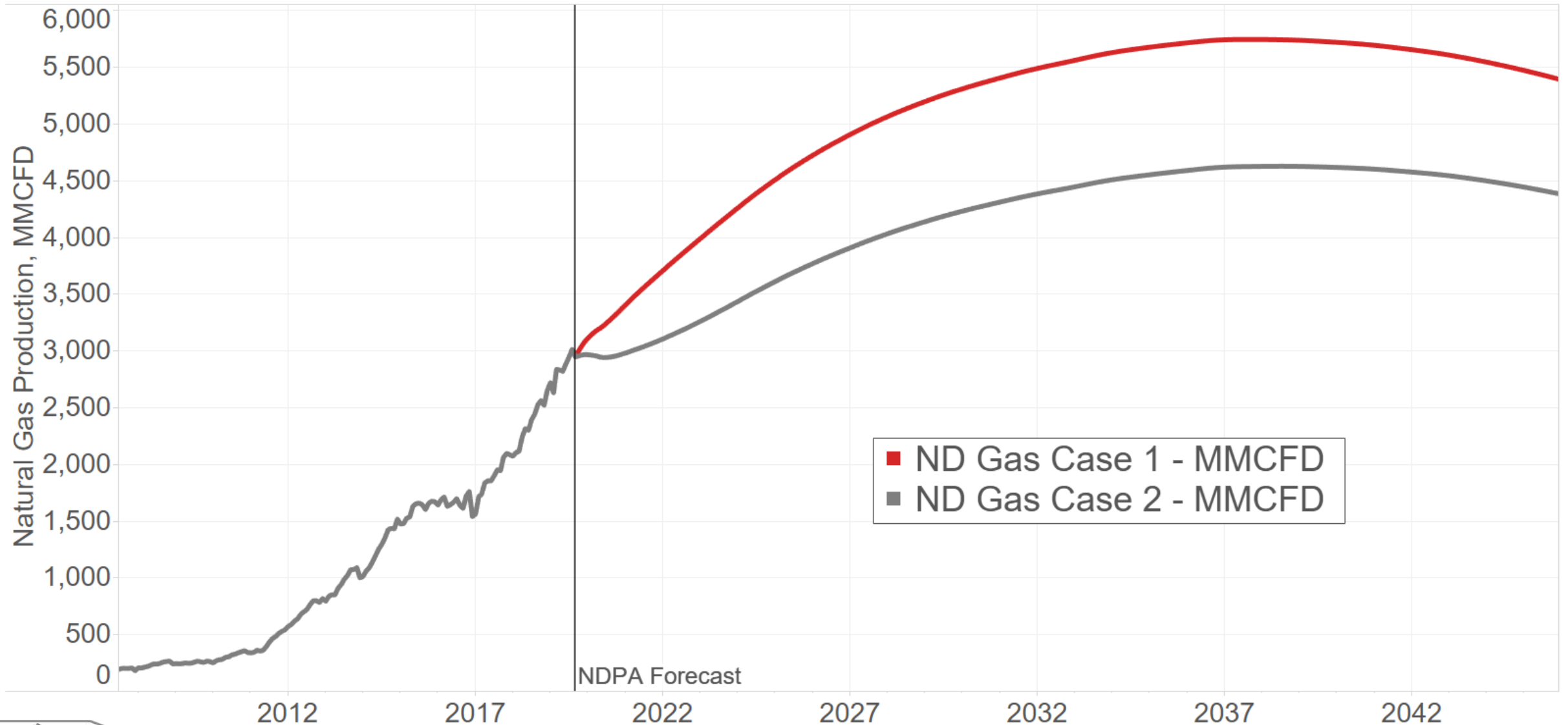
- | | | | | | |
|--|---|---|--|---|--|
|  Refinery |  Basin Transload |  Butte |  Double H |  Hiland |  Bridger |
|  Bakken Oil Express |  Belle Fourche |  Crestwood |  Enbridge |  Keystone Pipeline |  Targa |
|  BakkenLink |  Bridger |  Dakota Access |  Four Bears |  Little Missouri |  Marathon |

Bridger Expansion Project

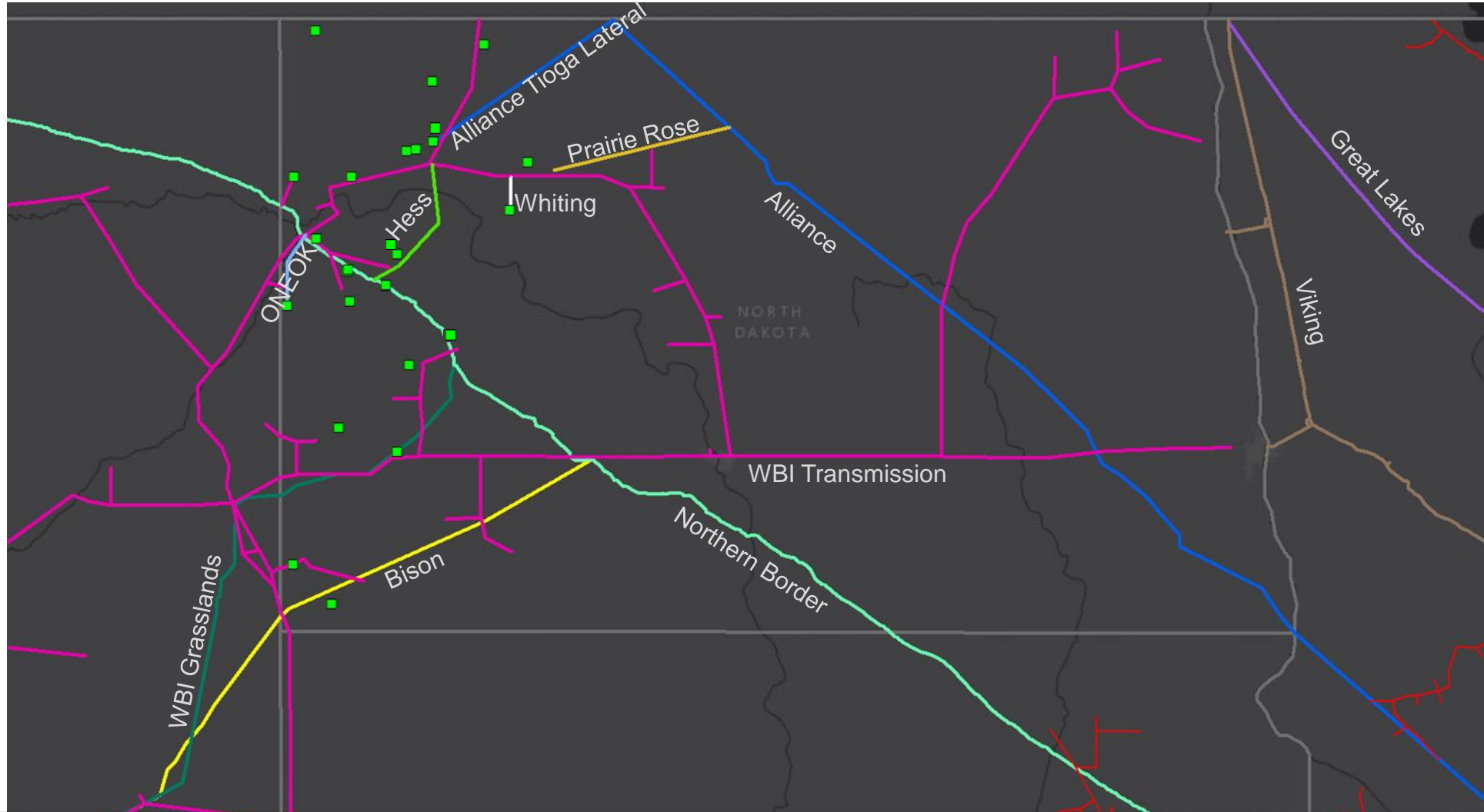


NDPA North Dakota Gas Production Forecast

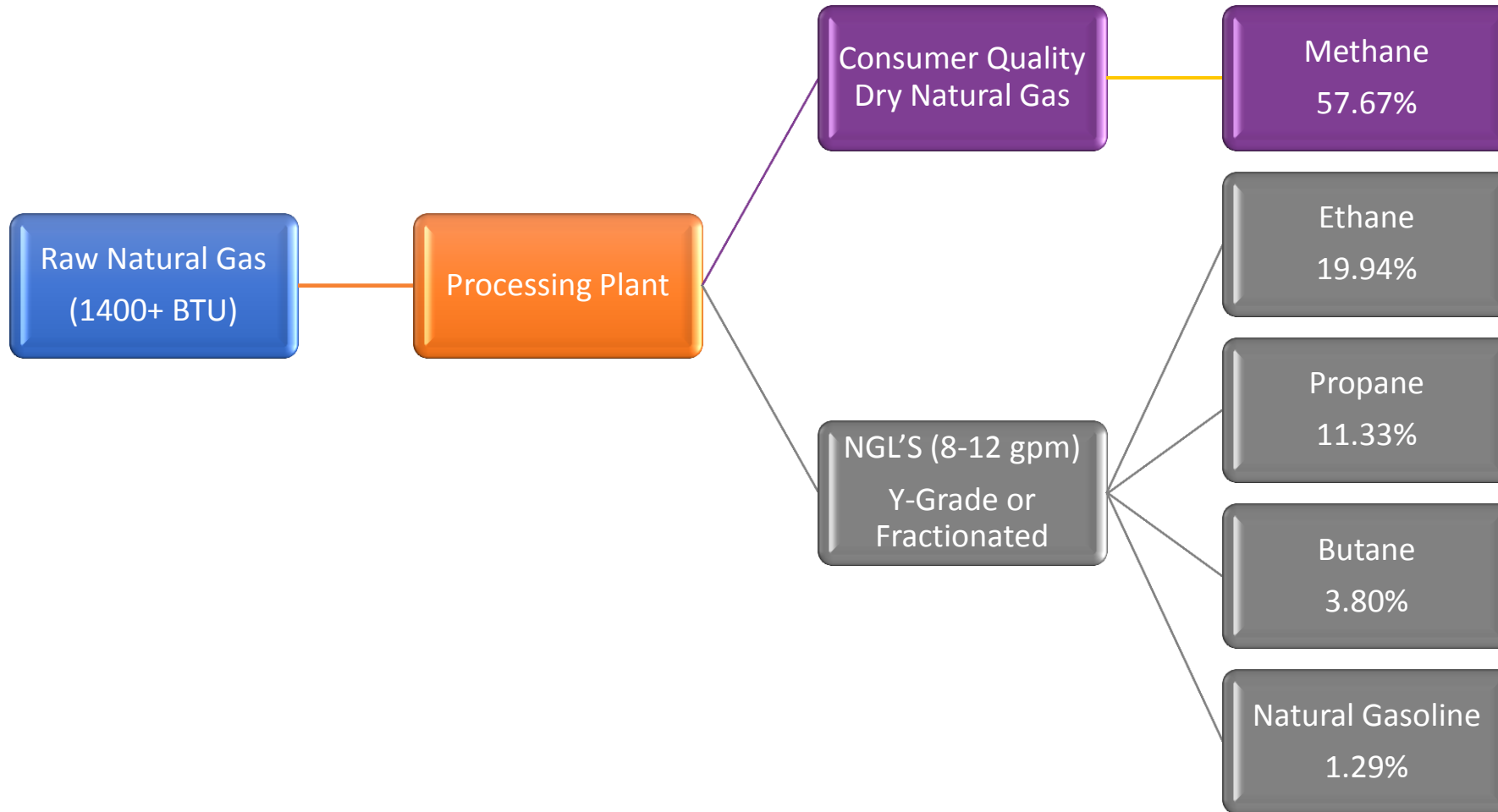
Assumes Current Technology – Enhanced Oil Recovery Not Included



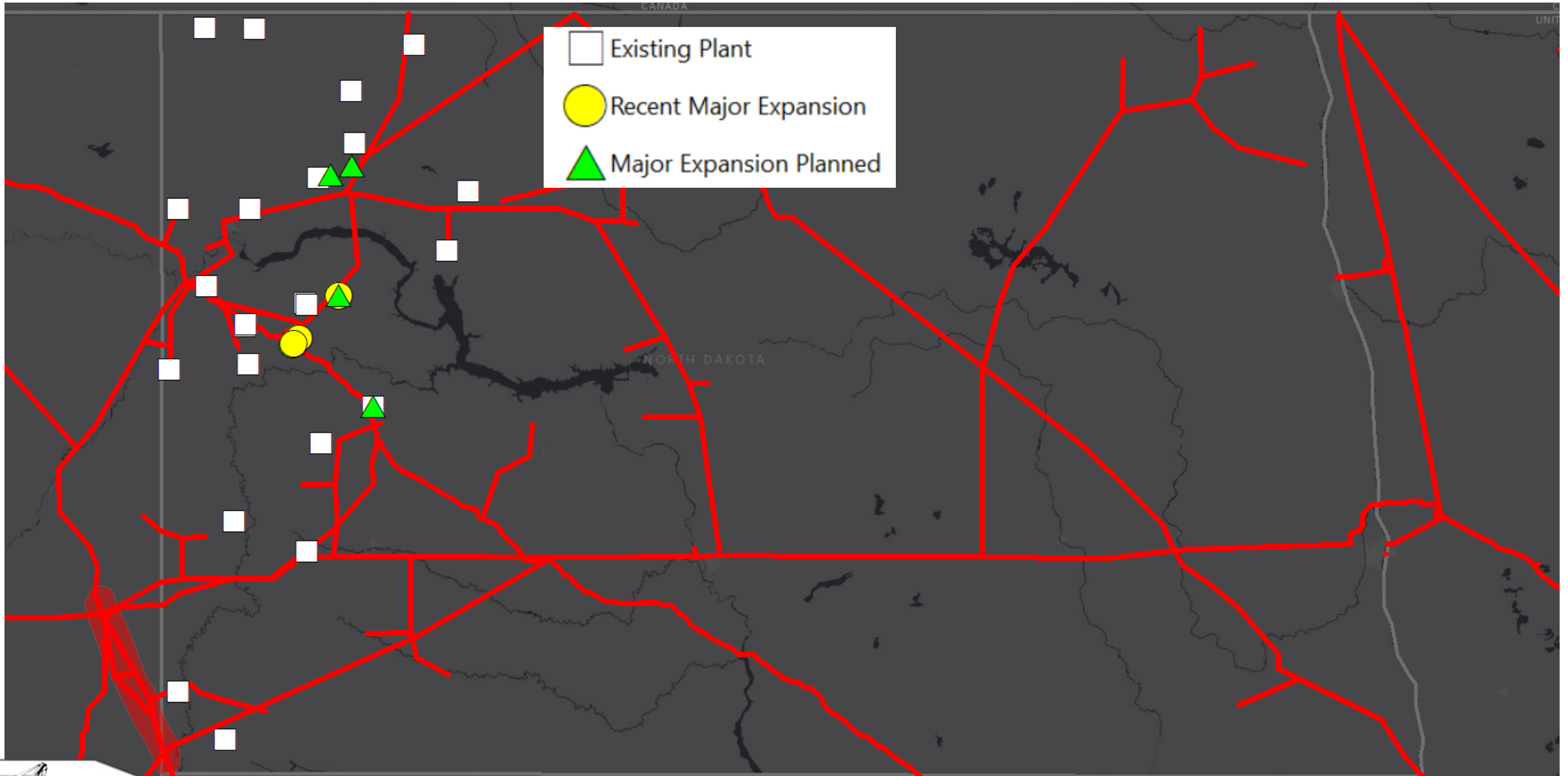
Major Gas Pipeline and Processing Infrastructure



Natural Gas Processing

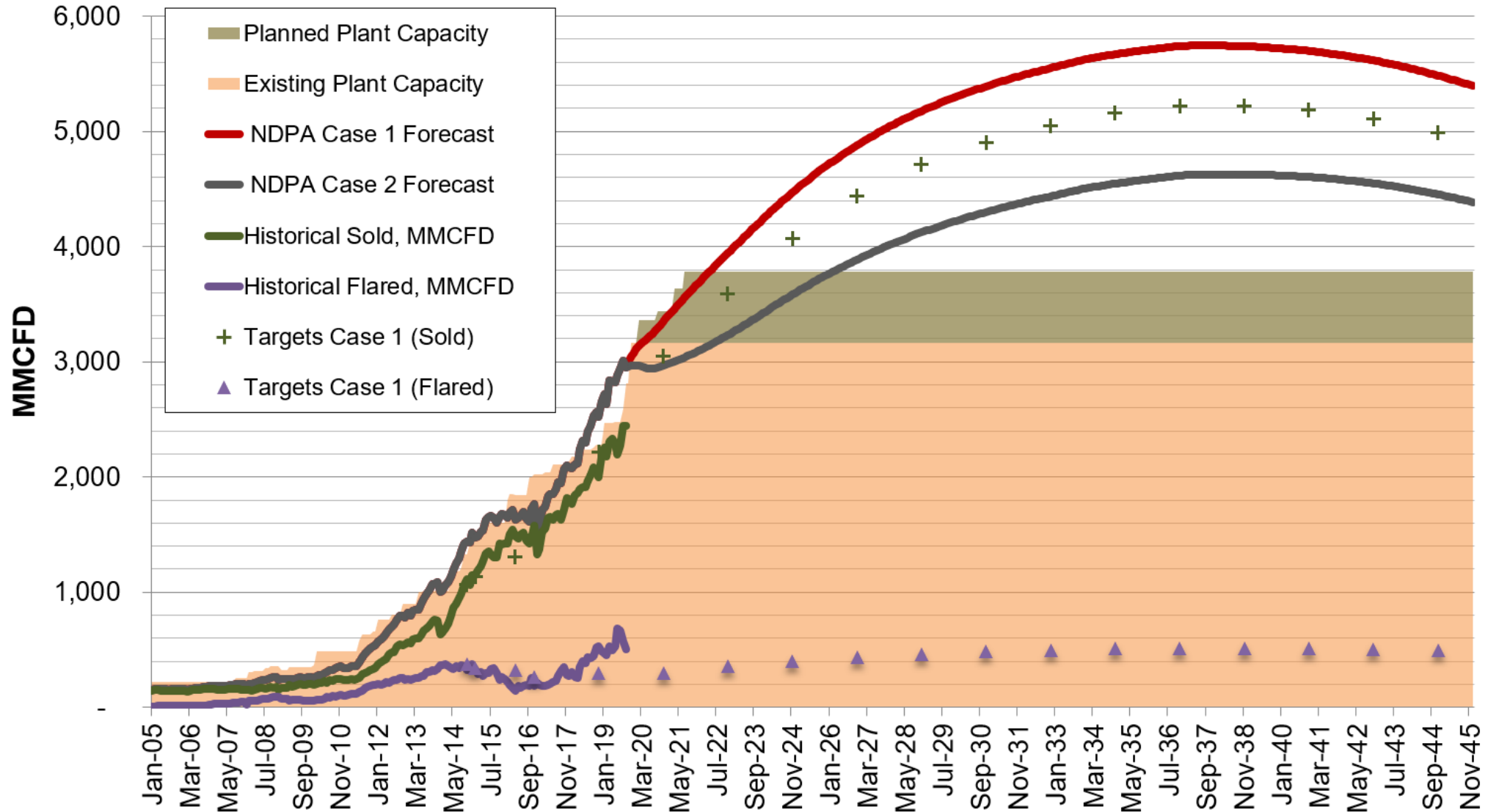


Gas Processing Expansions

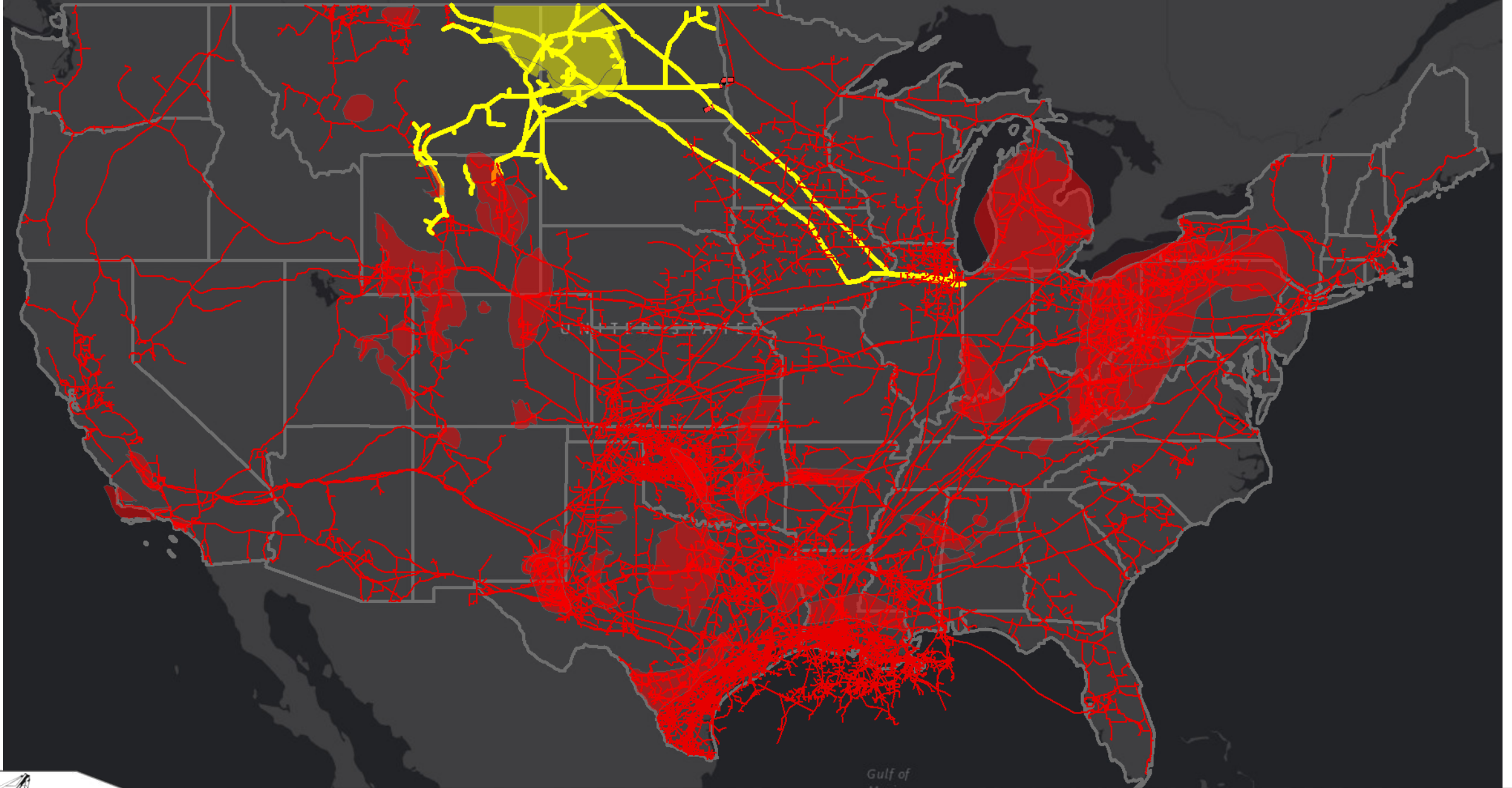


Solving the Flaring Challenge

Assumes Current Technology – Enhanced Oil Recovery Not Included



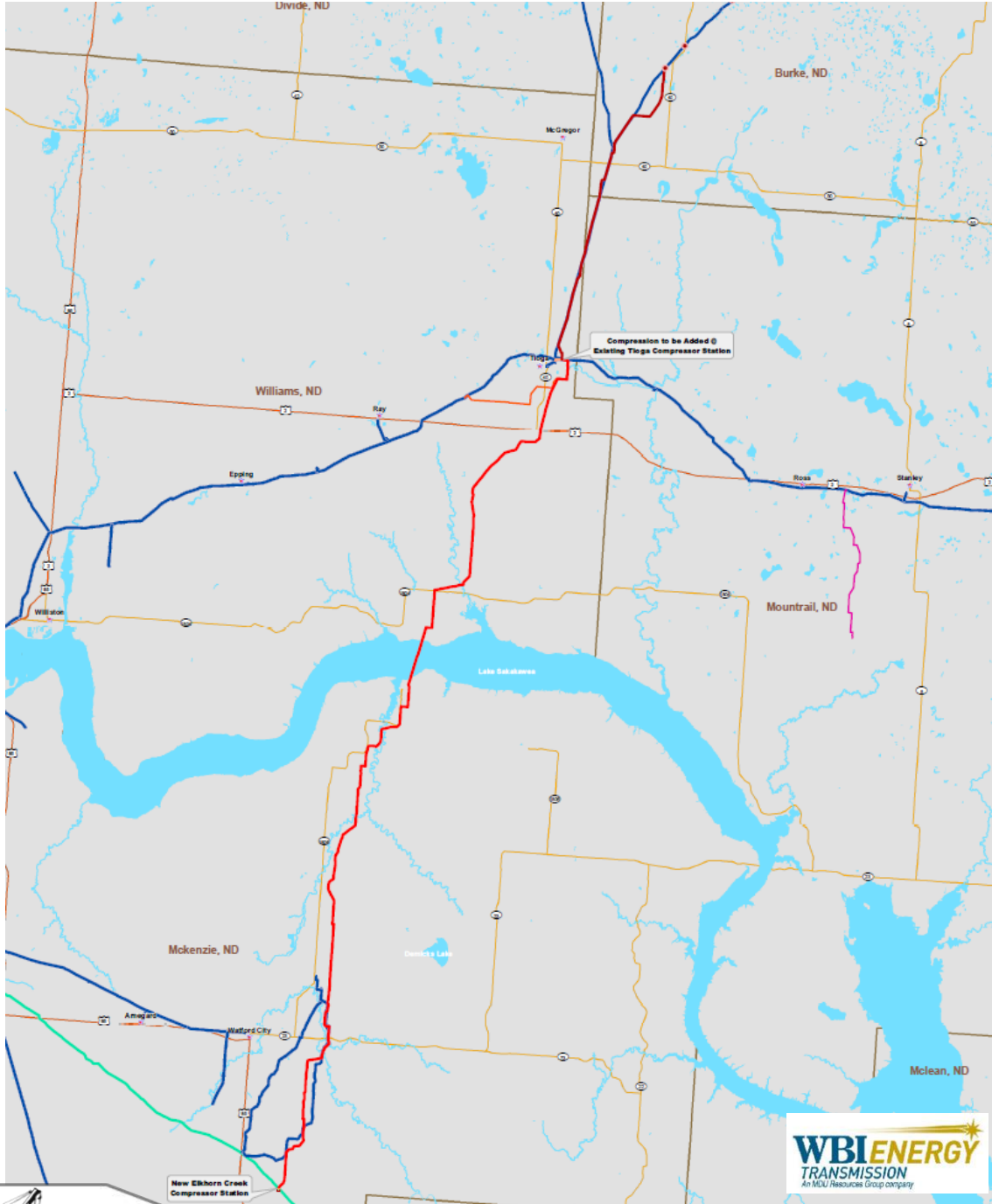
Bakken Natural Gas Infrastructure



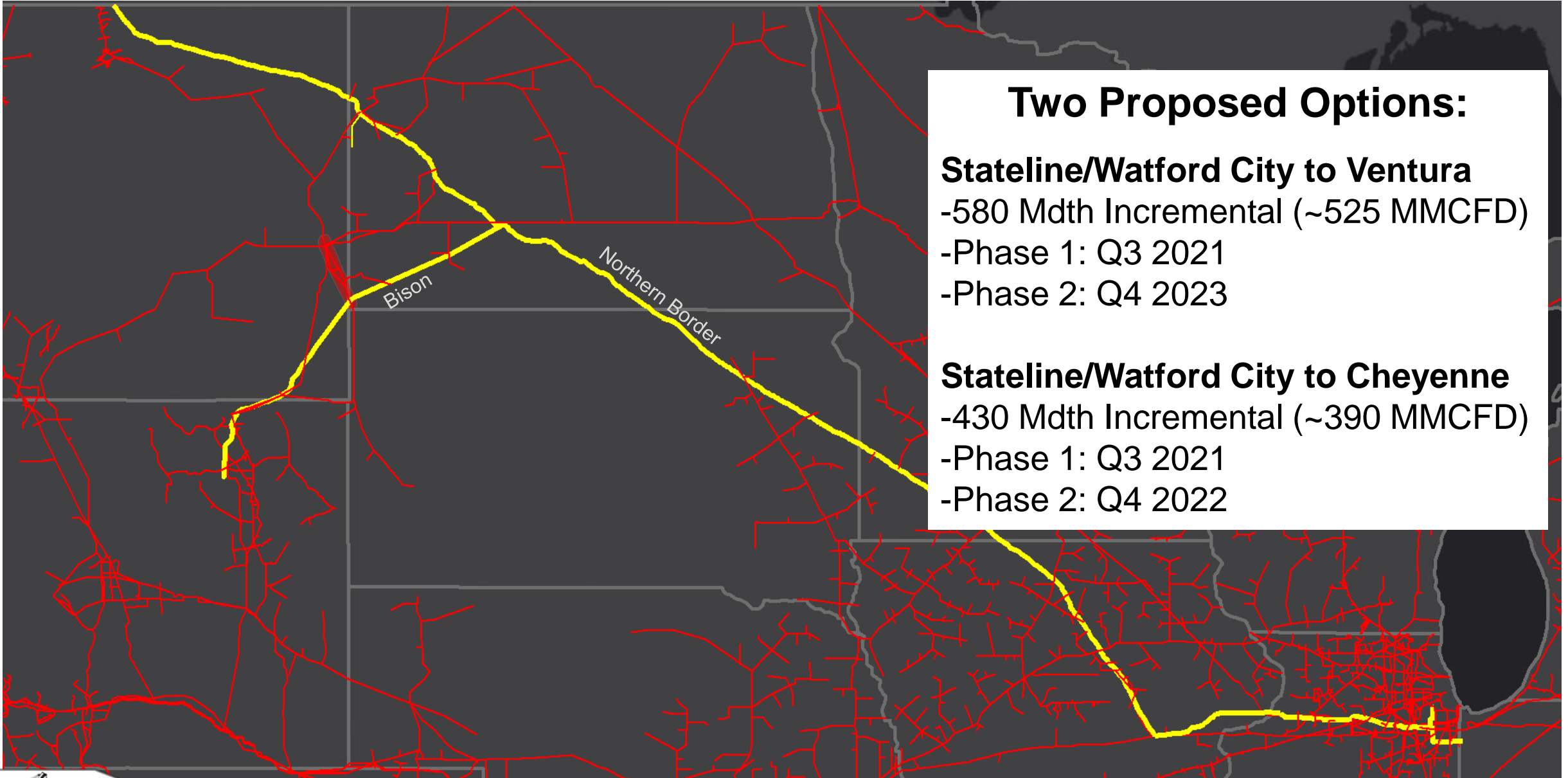
WBI Energy – North Bakken Expansion Project

Project Highlights

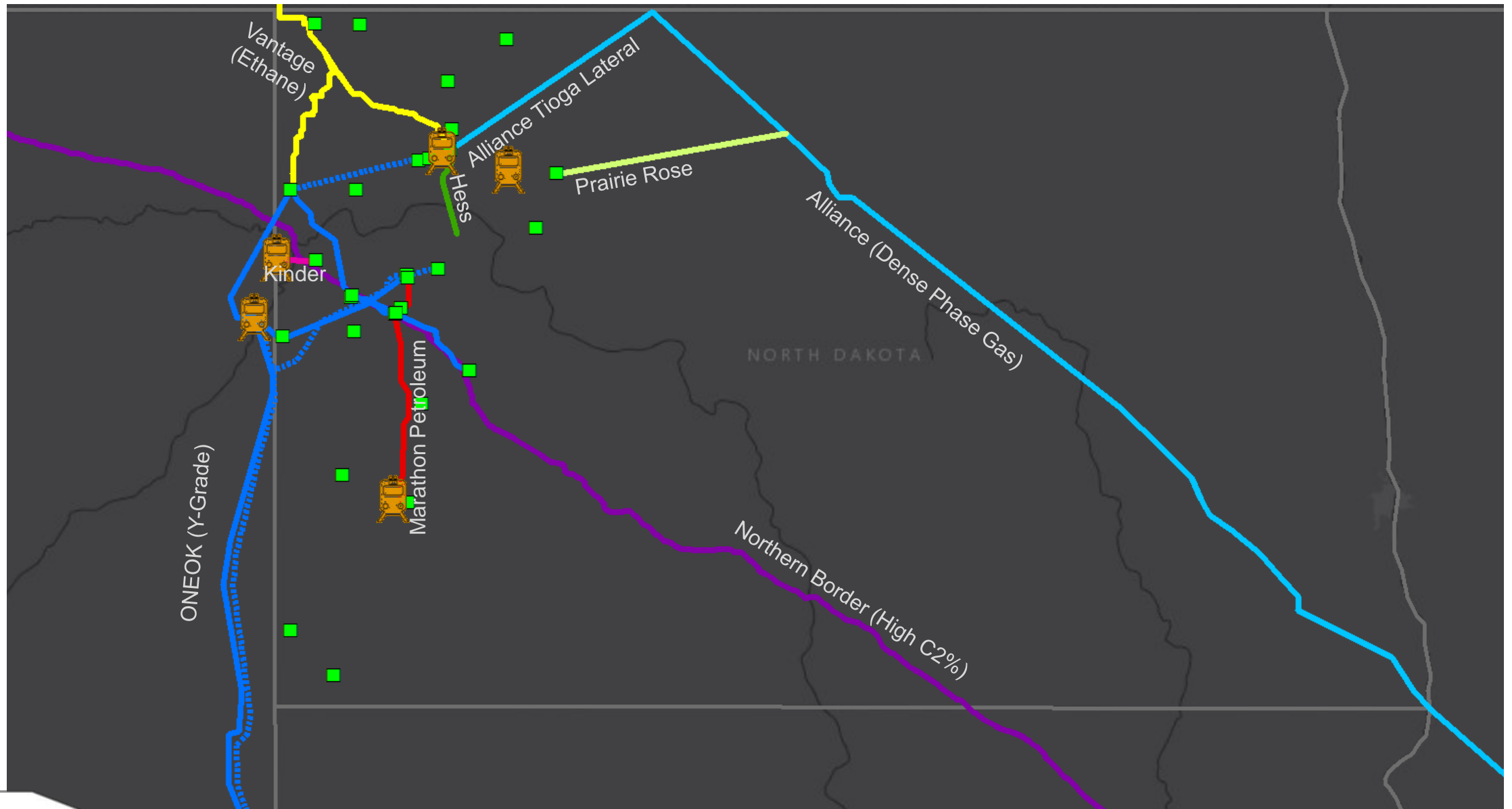
- 67 Miles - 20" Pipeline
- 20 Miles - 12" Pipeline
- \$220+ Million
- At least 250,000 MCFD Capacity (expandable)
- Expandable to 375,000 MCFD
- End of 2021 Proposed Completion
- Residue Gas Service From North of Lake Sakakawea to Northern Border Pipeline in McKenzie County



Northern Border Proposed Expansion Options

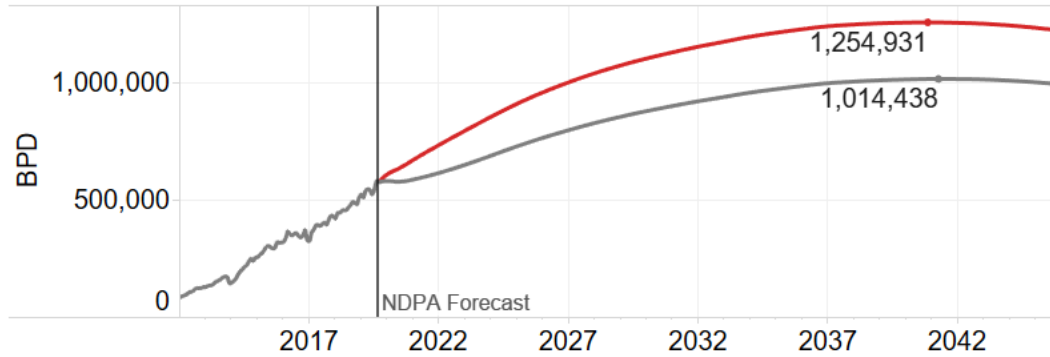


Regional NGL Infrastructure

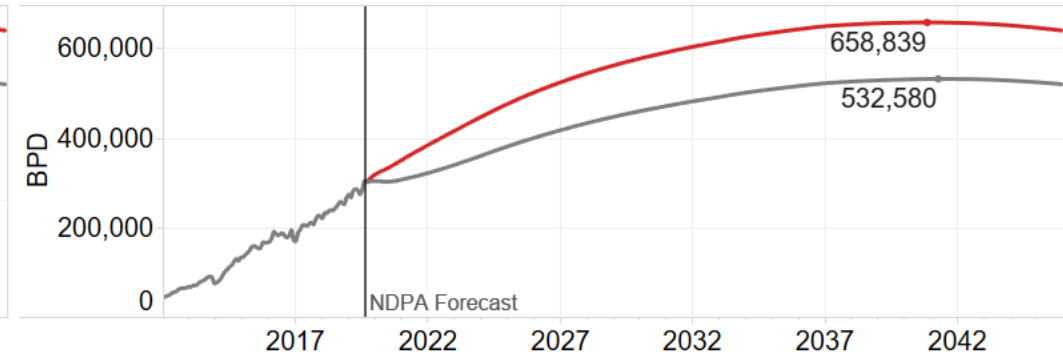


North Dakota Captured* NGL's

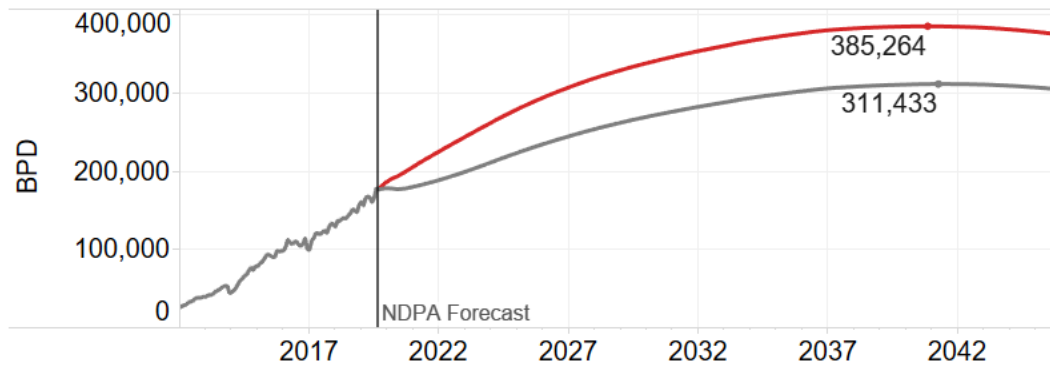
All Natural Gas Liquids



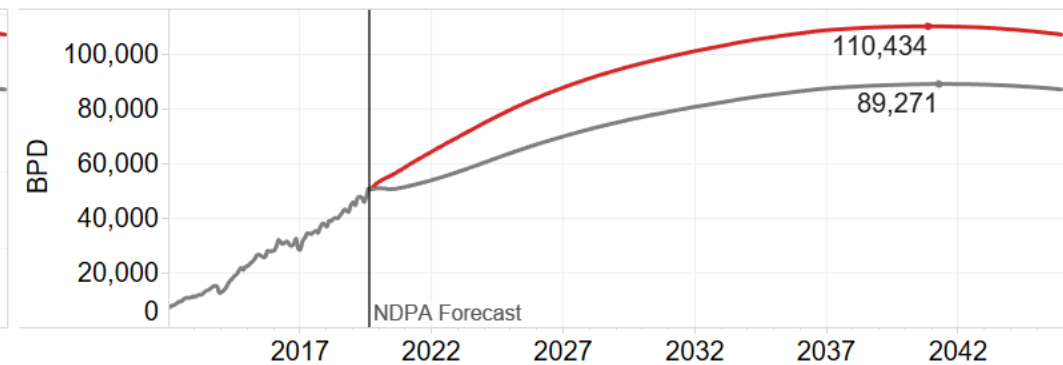
Ethane



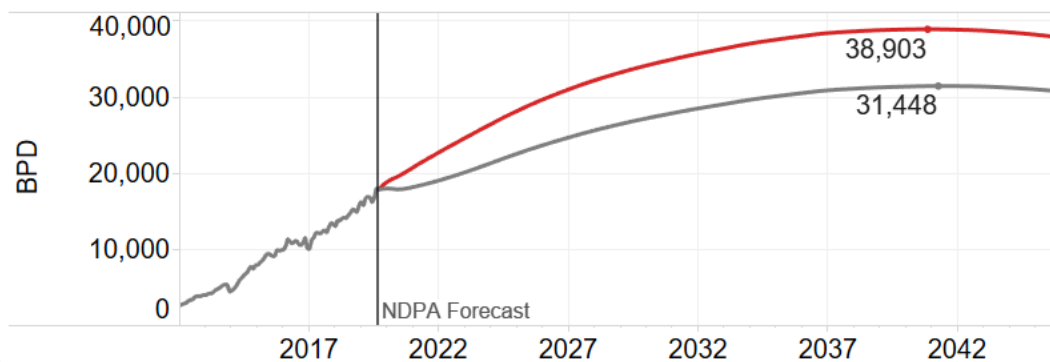
Propane



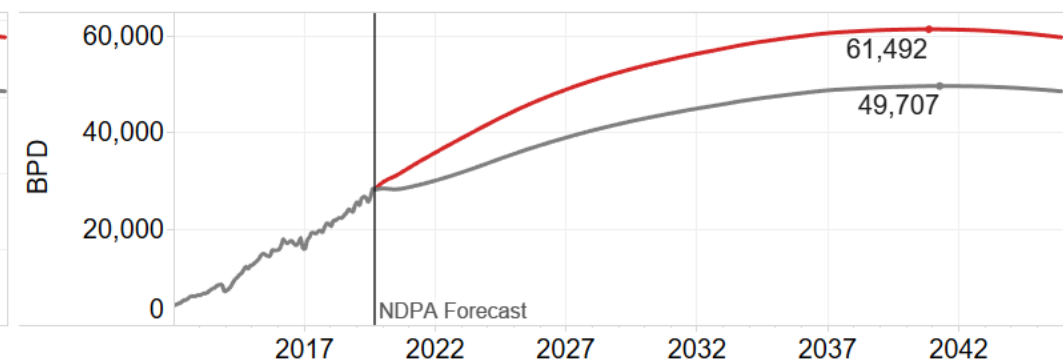
Butane



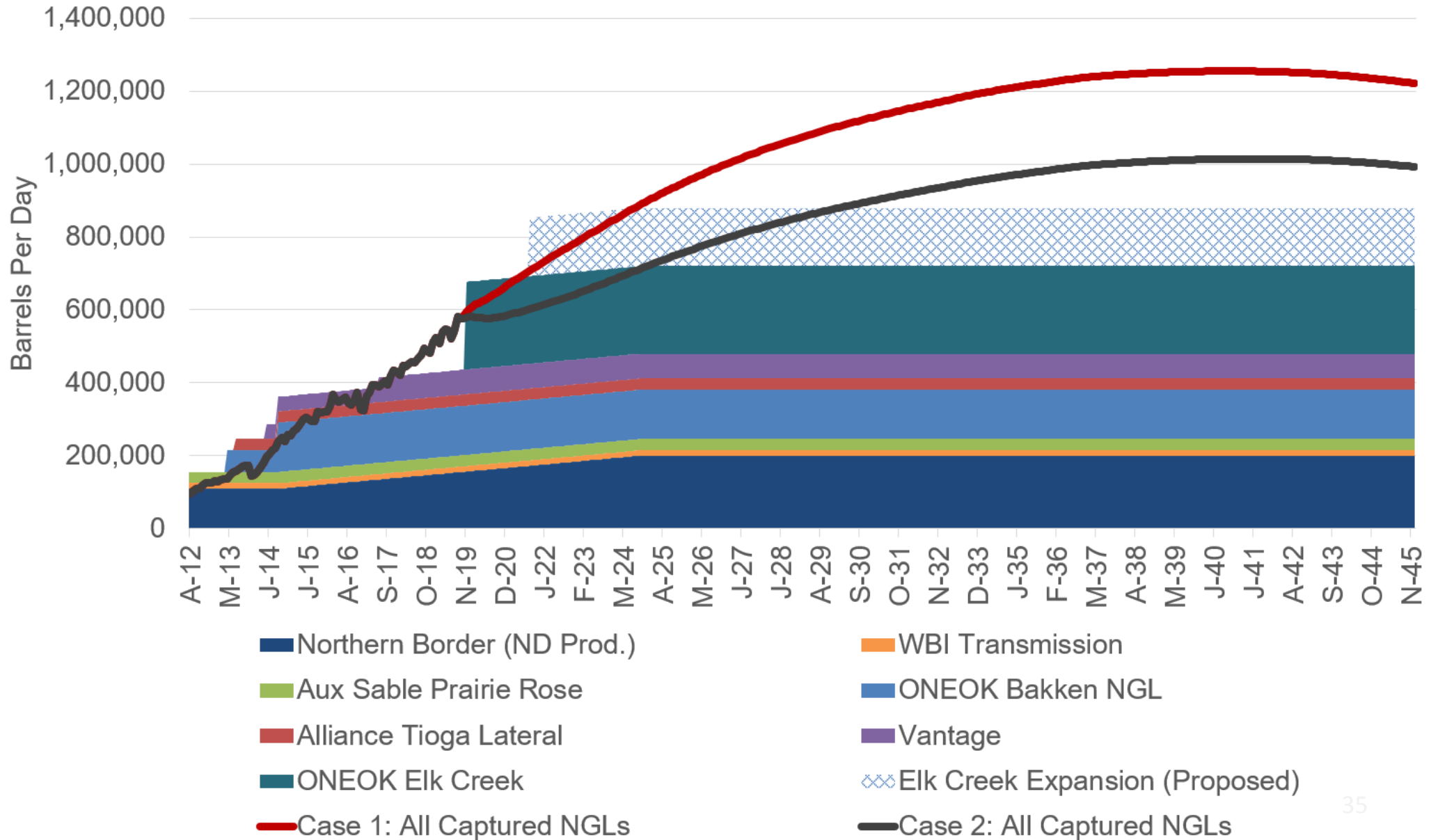
Isobutane



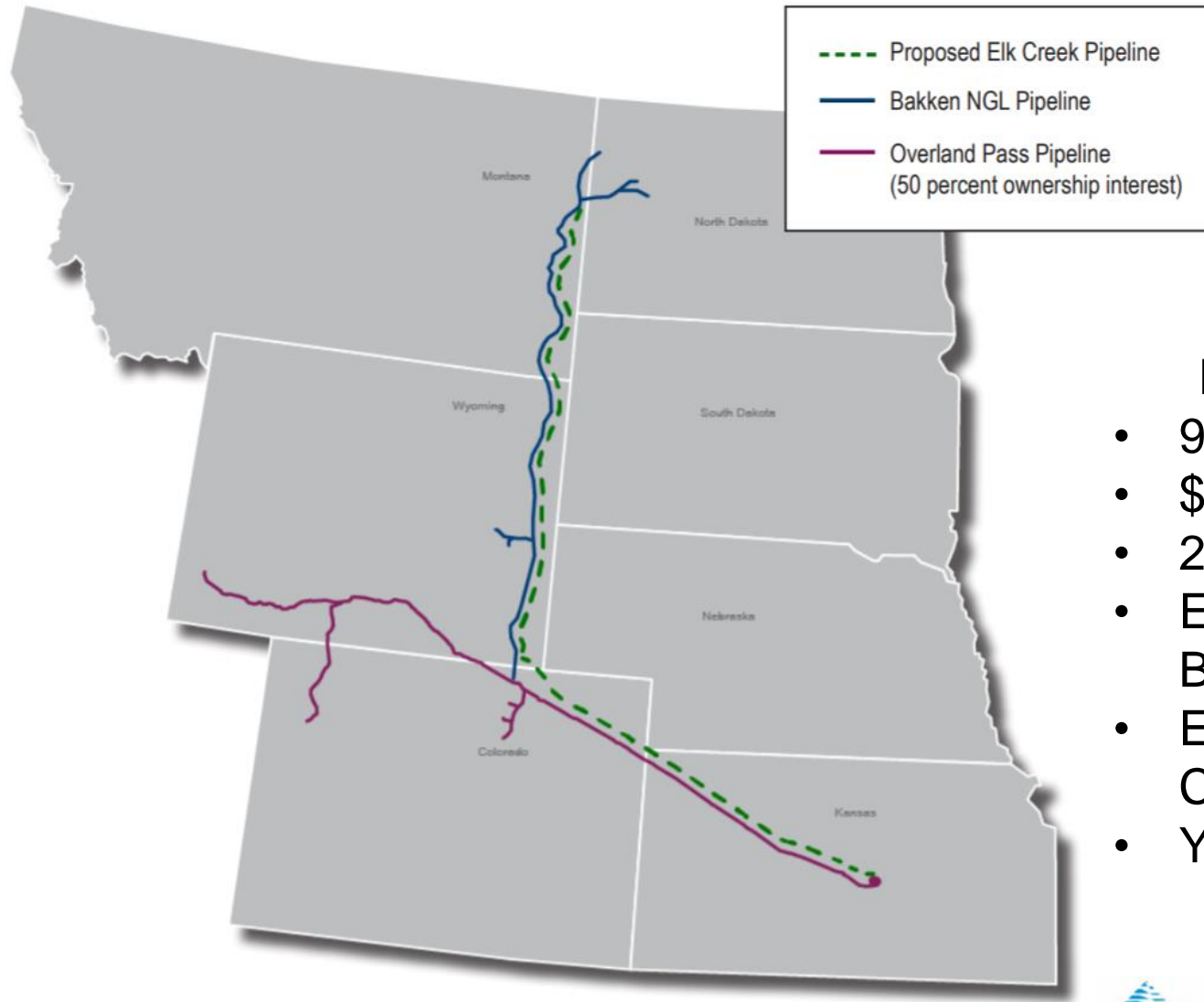
Natural Gasoline



NGL Pipeline Takeaway Options



ONEOK Elk Creek NGL Pipeline



Project Highlights

- 900 Miles - 20" Pipeline
- \$1.4 Billion
- 240,000 BPD Capacity
- Expandable to 400,000 BPD
- End of 2019 Proposed Completion
- Y-Grade Transportation



Contact Information

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