

# **North Dakota Pipeline Authority**



## **Annual Report July 1, 2017 – June 30, 2018**

Industrial Commission of North Dakota

Governor Doug Burgum, Chairman

Attorney General Wayne Stenehjem

Agriculture Commissioner Doug Goehring

# **North Dakota Pipeline Authority**

## **Annual Report**

### **July 1, 2017 – June 30, 2018**

#### **Overview**

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At the request of the North Dakota Industrial Commission, the Sixtieth Legislature passed House Bill 1128 authorizing the North Dakota Pipeline Authority. It was signed into law on April 11, 2007. The statutory mission of the Pipeline Authority is “to diversify and expand the North Dakota economy by facilitating development of pipeline facilities to support the production, transportation, and utilization of North Dakota energy-related commodities, thereby increasing employment, stimulating economic activity, augmenting sources of tax revenue, fostering economic stability and improving the State’s economy”. As established by the Legislature, the Pipeline Authority is a builder of last resort, meaning private business would have the first opportunity to invest in and/or build additional needed pipeline infrastructure.

By law, the Pipeline Authority membership is comprised of the members of the North Dakota Industrial Commission. Upon the recommendation of the Oil and Gas Research Council, the Industrial Commission authorized the expenditure of up to \$325,000 during the 2017-2019 biennium for the Pipeline Authority with funding being made available from the Oil and Gas Research Fund. On August 1, 2008 the Industrial Commission named Justin J. Kringstad, an engineering consultant, to serve as Director of the North Dakota Pipeline Authority. The North Dakota Pipeline Authority Director works closely with Lynn Helms, Department of Mineral Resources Director, Ron Ness, North Dakota Petroleum Council President and Karlene Fine, Industrial Commission Executive Director. The Pipeline Authority has no other staff and receives no direct General Fund appropriation. The Pipeline Authority Director reports to the Industrial Commission and the Oil and Gas Research Council on a regular basis.

#### **Statutory Authority**

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Statutory authority for the Pipeline Authority is found in Chapter 54-17.7 of the North Dakota Century Code (N.D.C.C.). Section 54-17.7-04 N.D.C.C. delineates the powers of the Pipeline Authority including: 1) making grants or loans or to borrow money; 2) to issue up to \$800 million in revenue bonds; 3) enter into lease-sale contracts; 4) own, purchase, lease, rent and dispose of pipeline facilities or the right to capacity in any pipeline system or systems within or without the State of North Dakota; 5) enter into contracts to construct, maintain and operate pipeline facilities; 6) investigate, plan, prioritize and propose transportation corridors; and 7) participate in regional pipeline organizations.

Before the Pipeline Authority may exercise its power to construct pipeline facilities, it must follow a process defined by statute to ensure public participation and comment. In particular, the Pipeline Authority must publish a notice describing the need for the pipeline project. Entities interested in

constructing the facilities or furnishing services to satisfy the identified needs have 180 days to respond by filing a notice of intent. If the Pipeline Authority receives a notice of intent from an interested entity, it may not exercise its powers to construct unless the Pipeline Authority makes a finding that doing so would be in the public interest. In making such a finding, the Pipeline Authority shall consider the economic impact to the state, economic feasibility, technical performance, reliability, past performance, and the likelihood of successful completion and ongoing operation.

## **North Dakota Pipeline Regulatory Programs**

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The Pipeline Authority does not serve in any capacity as a regulatory agency for the pipeline industry. North Dakota's pipeline industry is regulated by several state and federal agencies. Roles of each regulatory entity are complex and the Pipeline Authority urges all interested parties to please contact the agencies below for more information on their jurisdiction of the pipeline industry.

- North Dakota Department of Emergency Services
- North Dakota Department of Health
- North Dakota Department of Environmental Quality
- North Dakota Public Service Commission
- North Dakota Industrial Commission-Department of Mineral Resources-Oil and Gas Division
- Environmental Protection Agency
- Federal Energy Regulatory Commission
- U.S. Department of Transportation-Pipeline and Hazardous Materials Safety Administration-Office of Pipeline Safety

## **Summary of Activities**

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After bottoming out in the second quarter of 2016, petroleum related activity in North Dakota has continued to increase. With prices above \$60/barrel and higher levels of producer activity, the midstream industry is working to position itself to meet current production levels, and continue to plan for further expansion in the long term. More efficient operations and further advances in drilling and completion techniques allowed North Dakota oil and natural gas production to reach record high levels in 2018. During the past year, the Pipeline Authority has been fully engaged in continuing efforts to convert production and development information into oil and natural gas transportation solutions. Working alongside industry to produce crude oil and natural gas production forecasts to quantify future pipeline needs and time frames continues to be one of the principle tasks of the Pipeline Authority. Pipeline companies are conservative by nature and these forecasting exercises proved to be very beneficial in providing the confidence needed to move forward with expansion project planning.

During the fiscal year the Pipeline Authority contacted, met with, and shared information with numerous interested parties, including the following:

Enbridge Pipeline  
TransCanada  
MDU/WBI Energy  
ONEOK  
Alliance Pipeline  
Northern Border Pipeline  
Basin Electric  
KLJ Engineering  
Loenbro  
Badlands NGLs  
Whiting  
Enable Midstream  
Energy Transfer Partners  
GA Group  
Oasis Petroleum  
Aurora Energy  
Petro Nerds  
Meridian Energy Group  
Steel Reef Infrastructure  
Global Innovative Solutions  
Phillips 66

Hess Corporation  
Tesoro/Andeavor  
True Companies  
Crestwood  
BNSF Railway  
Citi Bank  
Gtuit  
Plains All American  
Sequent Energy  
Barr Engineering  
Pembina Pipeline  
Moody's Analytics  
Harris Corporation  
Parsons Brinkerhoff  
Marathon  
Elevate Midstream  
Tallgrass Pipeline  
Robert W. Baird & Co.  
Liberty Midstream  
Thrive Energy

In addition, the Pipeline Authority worked with a number of state and federal agencies to gather information and provide expertise on pipeline issues. Those agencies and entities included:

North Dakota Public Service Commission  
North Dakota Transmission Authority  
North Dakota Oil and Gas Division  
North Dakota Governor's Office  
North Dakota Department of Trust Lands  
North Dakota State University  
Bank of North Dakota  
US Energy Information Administration  
North Dakota Oil & Gas Research Program  
MHA Energy  
North Dakota Office of Management and Budget

North Dakota Department of Commerce  
Energy and Environmental Research Center  
North Dakota Department of Transportation  
Federal Railroad Administration  
North Dakota Tax Department  
Wyoming Pipeline Authority  
EmPower North Dakota Commission  
North Dakota State Water Commission  
Upper Great Plains Transportation Institute  
Federal Transportation Safety Administration

The Director of the Pipeline Authority also worked with the following trade associations/groups:

North Dakota Petroleum Council  
North Dakota Petroleum Marketers Association  
Western Dakota Energy Association  
North Dakota Building Trades Union  
American Petroleum Institute  
Landman's Association of North Dakota  
Minot Chamber of Commerce

As noted above, the Pipeline Authority has been facilitating discussions between governmental agencies and companies interested in expanding North Dakota's midstream infrastructure.

In addition, the Director of the Pipeline Authority provided information to citizens and news media on issues related to pipelines.

### Crude Oil and Natural Gas Production Forecasting

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The Pipeline Authority continued to develop and maintain crude oil and natural gas production forecasts for North Dakota and the United States portion of the Williston Basin. These forecasts are widely used throughout both public and private organizations. Two assumption scenarios are forecasted for the purpose of communicating the production impacts of different price and activity levels. Figure 1 is a long term oil production forecast for North Dakota. Figure 2 shows a longer term natural gas production forecast using the two different activity scenarios for North Dakota.

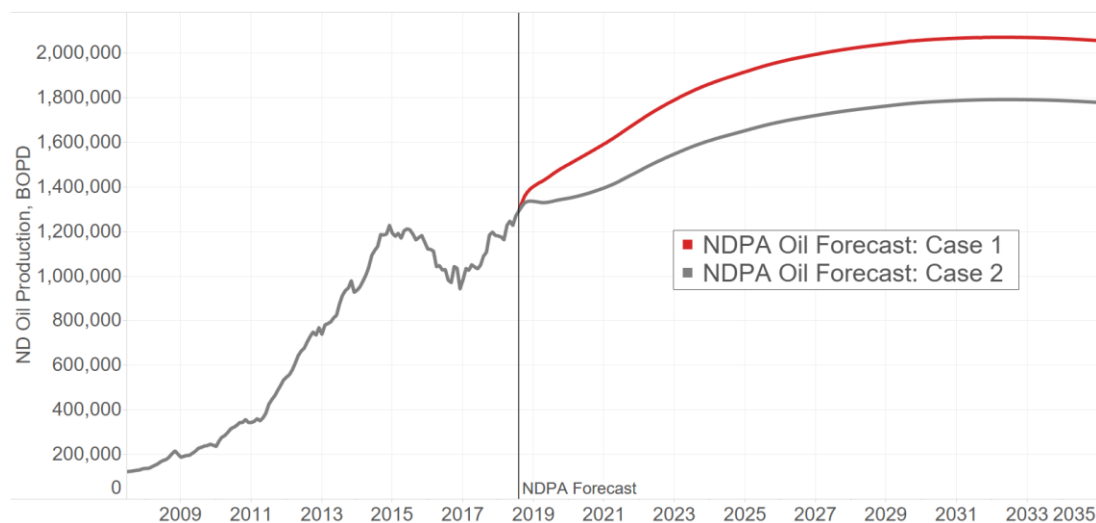


Figure 1. Long term crude oil production forecast for North Dakota starting in Aug. 2018

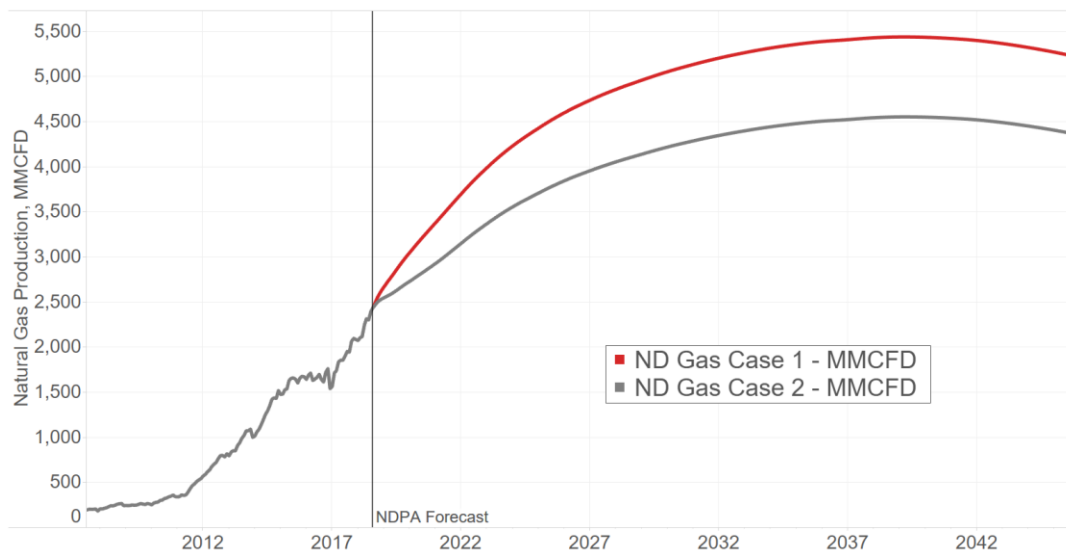


Figure 2. North Dakota natural gas production forecast starting in Aug. 2018

## Natural Gas Liquids

The Pipeline Authority continued to focus considerable attention in 2017-2018 to the topic of natural gas liquids (NGLs). Natural gas produced from the Bakken and Three Forks Formations is very high in NGLs such as ethane, propane, and butane. Forecast models created by the Pipeline Authority were updated to better understand the production potential and required transportation infrastructure going forward.

The forecast in Figure 3 shows two potential production cases based on different activity level assumptions. In either case, a significant shortfall of gross pipeline capacity exists until the Elk Creek Pipeline goes into service in late 2019. It is expected that NGL production will exceed pipeline capacity again in 2020 until further system expansions take place or a new market option is developed. Further complicating the NGL transportation dynamics is the fact that not all NGL pipelines can handle the same types of NGL products. In addition, natural gas plants around the region produce either purity products or unfractionated product, known as Y-grade.

There are several options going forward to address the growing volume of NGLs in North Dakota. One option would be to build, expand, or repurpose existing pipeline systems. A second option would be the development of value-added industries that would use NGL products as feedstock. Another potential use for NGLs is enhanced oil recovery (EOR) in the Williston Basin as fields continue to mature. The use of NGLs as a working EOR fluid is still in the research phase with early lab results appearing promising.

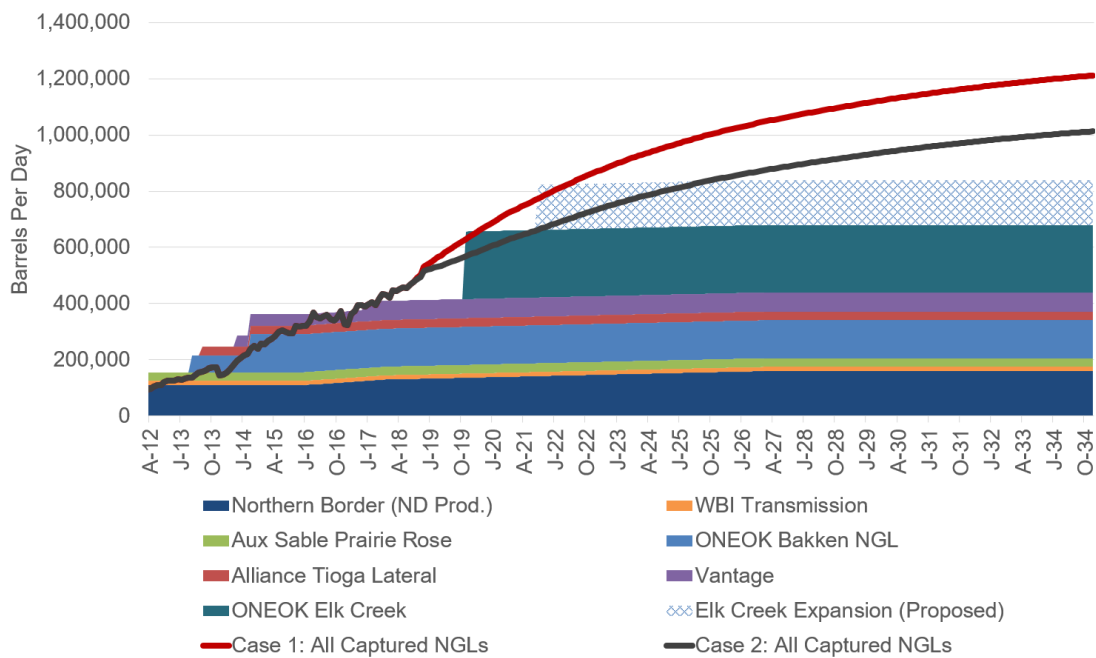


Figure 3. Forecasted North Dakota NGL production and transportation options starting in Aug. 2018

## State Rail Plan

The Pipeline Authority and a number of other partners worked alongside the North Dakota Department of Transportation in its efforts to publish a 2017 update to the *North Dakota State Rail Plan*.

Along with the hired consultant agency, Parsons Brinckerhoff, the Department of Transportation partnered with the following agencies to conduct the study:

- North Dakota Public Service Commission
- North Dakota Department of Commerce
- North Dakota Department of Emergency Services
- North Dakota Pipeline Authority
- Upper Great Plains Transportation Institute

The updated North Dakota State Rail Plan is focused on the following key areas:

- Ensuring safe rail transportation
- Providing consistently reliable, diverse Class I, short line and passenger rail service
- Rail service expansion and economic development opportunities
- Funding future rail improvements
- Understanding and defining the role of the State of North Dakota in rail transportation

The final State Rail Plan report was released in late 2017 and is available on the Department of Transportation website.

## Natural Gas Flaring

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While not a regulatory agency, the Pipeline Authority does play a very active support role in helping the state reduce the amount of flared natural gas. The Pipeline Authority continually monitors and reports flaring statistics and provides analysis on current and future developments to industry participants, regulators, policy makers, and the public.

Several significant actions were taken by the ND Industrial Commission in recent years that have had a positive impact on reducing natural gas flaring. The first was the requirement for operating companies to submit a natural gas capture plan to the Oil & Gas Division to outline how produced natural gas would be sold or utilized on location. The second action was an Industrial Commission order on July 1, 2014 that provided flaring reduction targets to the year 2020 and provided a means of enforcement at the Oil & Gas Division through the use of production and permitting restrictions.

In April 2018, the Industrial Commission updated the 2015 natural gas capture regulations for Bakken and Three Forks production. More details on the April update can be found on the Oil & Gas Division website.

The current North Dakota gas capture target rates are as follows:

- 74% Capture – Q4 2014
- 77% Capture – Q1 2015
- 80% Capture – Q2 2016
- 85% Capture – Q4 2016
- 88% Capture – Q4 2018
- 91% Capture – Q4 2020

The natural gas gross capture rate for Bakken production was 84% in June 2018. In order for the industry to continue to meet or exceed future gas capture targets, additional investments in gas gathering, processing, and transmission will be required in the short and long term.

## Industry and Public Communications Activities

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### ***Pipeline Publication***

During the 2017-2018 fiscal year, three *Pipeline Publication* newsletters were created in order to keep interested parties updated on midstream activities in the region. All three newsletters can be found in Appendix A. In addition to the newsletters, the Pipeline Authority used monthly reports, website content, press conferences, and presentations to share updates on production and transportation dynamics in the Williston Basin (additional details below).

### **Pipeline Authority Websites**

In an effort to provide industry and public users with the most timely and complete set of information, the Pipeline Authority continues to update the agency websites as new information becomes available.



The websites allow the Pipeline Authority to provide users with current Williston Basin oil production data, maps, news, publications, basic pipeline information, pipeline safety information, and links to pipeline mapping systems.

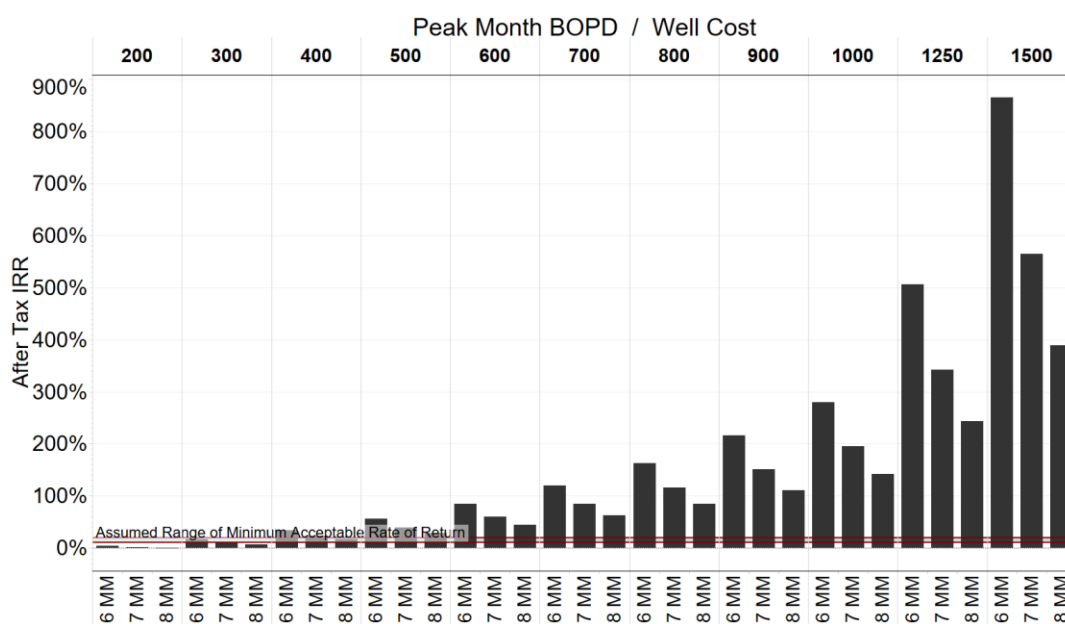
### Monthly Updates

During the 2017-2018 fiscal year, the Pipeline Authority produced monthly transportation and production reports to allow interested parties a quick view of how much crude oil and natural gas was produced each month and how each commodity was shipped and/or processed. Information contained in the reports is presented during monthly media events in conjunction with the ND Oil & Gas Division. Monthly reports are placed on the Pipeline Authority website and an email distribution list has been created to circulate the update to interested parties.

### North Dakota Drilling Economics

In order to assist the midstream industry in understanding current and future petroleum activity levels, the Pipeline Authority routinely publishes information exploring the economics of drilling in North Dakota's Bakken/Three Forks Formations. The research takes a detailed look at where drilling in North Dakota has been most successful in the past and then predicts where drilling may be concentrated during periods of fluctuating oil prices.

Figure 4 was generated during the drilling economics research to represent the expected after-tax rate of return using three different drilling and completion costs. While assuming \$63/barrel at the wellhead, it was discovered that wells drilled in North Dakota could consistently receive a 10%-20% rate of return if they were producing at least an average of 400 barrels of oil per day during the well's peak production month. Maps were generated to show where the wells in Figure 4 are located. These maps are contained in various presentations on the Pipeline Authority website.



## **Pipeline Presentations**

The Pipeline Authority has had the opportunity to make presentations at a variety of legislative, industry, and public events during the past fiscal year. Presentation topics were typically focused on North Dakota's transportation dynamics and did contain additional material on drilling economics and production techniques. Slides from many of the major events are placed on the Pipeline Authority website as content is updated.

## **Drilling Inventory Analysis**

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During the first half of 2018, the Pipeline Authority conducted extensive research to better understand how long the first phase of drilling and completing Bakken/Three Forks wells may last in North Dakota.

The research revealed the following points of interest:

- Bakken/Three Forks development is price sensitive, with higher price levels equating to more economically viable drilling locations in the state.
- A high level of uncertainty exists surrounding full development of the lower Three Forks formation "benches".
- Three Forks development was broken into a three tier system using information from Tim Nesheim at the North Dakota Geological Survey.
- It is estimated that between 34,000 and 98,000 wells will be developed during the first phase of Bakken/Three Forks development.
- Assuming a pace of 100 new wells drilled and completed per month, North Dakota's first phase of Bakken/Three Forks development could continue for 28-81 years.

*Full details of the drilling inventory work can be found on the "Presentations" page of the Pipeline Authority website.*

## **Williston Basin Pipeline Infrastructure**

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*For reference, a series of North Dakota pipeline maps can be found in Appendix B*

## **Pipeline Mileage**

North Dakota's pipeline industry added 996 miles of new oil, gas, and produced water pipelines in 2017. The significant decrease in pipeline construction in 2016 and 2017 (Fig. 5) was proportional to the slowdown in well completions during those same periods. A general trend in North Dakota has been approximately 1-1.5 miles of new pipeline added for every well completion. Data from the Federal Department of Transportation and North Dakota Oil & Gas Division indicates that North Dakota has over 27,000 miles of gathering and transmission pipelines. Further details about North Dakota's pipeline network can be found on the Pipeline Authority website.

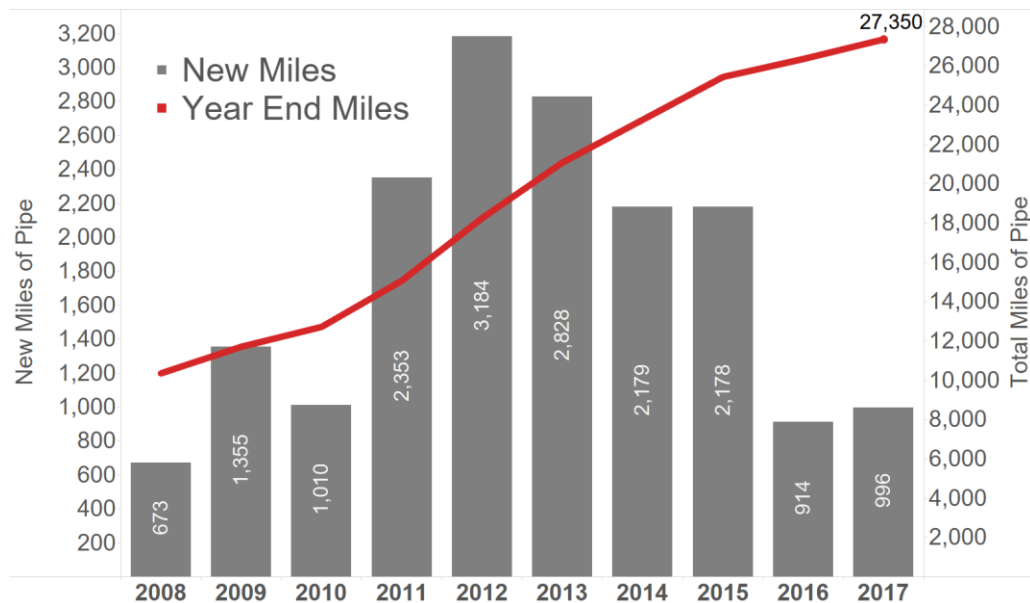


Figure 5. Estimated oil transportation by mode

### **Crude Oil Pipelines, Refining, and Rail Transportation**

**Enbridge Pipelines North Dakota:** Having completed several expansion projects over the past number of years, Enbridge now has the capacity to move 355,000 BOPD on its pipeline system to Clearbrook, MN. Enbridge completed their work to expand north bound capacity of 145,000 BOPD in early 2013 for the larger scale “Bakken Expansion Project”. Oil using the northbound route navigates the Enbridge Saskatchewan system to an interconnect with the Enbridge Mainline at Cromer, MB. Once on the Mainline system, the Williston Basin oil quickly reenters the United States and meets east bound Enbridge oil at Clearbrook, MN.

Enbridge’s plans to construct the 225,000 BOPD “Sandpiper” system were deferred during the third quarter of 2016 due to unexpected market conditions in the near-term planning horizon. Enbridge plans to monitor market conditions and will reevaluate the Sandpiper project in the future.

**Bridger, Belle Fourche, and Butte Pipelines:** Bridger and Belle Fourche Pipelines operate as intra-basin pipeline systems moving oil to several pipeline interconnects or rail facilities in the Williston Basin. One such pipeline interconnect is with the Butte Pipeline near Baker, MT. The Butte Pipeline currently has the capacity to move 260,000 BOPD to Guernsey, WY. In Guernsey, WY, the oil is transported to Wood River, IL on the Platte Pipeline, Cushing, OK on the White Cliffs Pipeline, or loaded into rail cars for further transport.

**BakkenLink:** After announcing plans in 2010 to offer a pipeline system connecting the Williston Basin to the Keystone XL Pipeline in Eastern Montana, BakkenLink has altered their current project scope. Now in service, the BakkenLink system collects crude oil from various locations along its route south of Lake Sakakawea and delivers the oil to a unit train rail facility located near Fryburg, ND. In late 2015, Andeavor

(formerly Tesoro Corporation) purchased the BakkenLink pipeline and rail facility from Great Northern Midstream.

In February 2018, Andeavor sought, and was granted, approval from the North Dakota Public Service Commission to add NGL service to the existing BakkenLink crude oil system. Scheduled to be complete by the end of 2018, the additional NGL service to Fryburg, ND will be accomplished using three new line segments on the north and south ends of the BakkenLink system.

**Energy Transfer Partners:** In early 2014, Energy Transfer Partners (ETP) held an open season to solicit interest in a new 30" pipeline from North Dakota to Patoka, IL. In June 2014, ETP announced that they had secured sufficient shipper support to move forward with the project. The "Dakota Access" pipeline collects oil north and south of Lake Sakakawea and has the ability to transport up to 520,000 BOPD. The project began construction in May 2016 and was placed into commercial service on June 1, 2017.

In 2018, two formal open seasons were held for additional service on the Dakota Access pipeline. Results of the open season have not been made public, but if additional shipper interest exists, the pipeline could be expanded to carry a total of at least 570,000 BOPD.

**Plains All American Pipeline:** In November 2010, Plains All American Pipeline (Plains) announced plans to construct a new 103 mile, 12 inch, pipeline from Trenton, ND to an interconnect with the existing Wascana Pipeline at the United States-Canada border in northeast Montana. The "Bakken North" pipeline went into service in May 2014, with an initial capacity of 40,000 BOPD, expandable to 75,000 BOPD.

**TransCanada Bakken Marketlink:** On September 13, 2010, TransCanada launched a successful open season for Bakken producers interested in accessing TransCanada's proposed Keystone XL pipeline project in eastern Montana. The proposed 100,000 BOPD interconnect would be located near Baker, MT and would require new pumps and tanks to accommodate the Bakken oil. Third party shippers would be necessary to move the crude to the Baker, MT facility from North Dakota.

In November 2015, President Obama announced that the Keystone XL Pipeline was not in the national interest of the United States and that a required Presidential Permit would not be granted. In March 2017, President Trump reversed the White House decision and granted the Presidential Permit to TransCanada for the Keystone XL Pipeline. An updated timeline for the Keystone XL Pipeline and Bakken Marketlink has not been made public.

**Marathon Petroleum Mandan Refinery (Formerly Andeavor/Tesoro):** Expanded by 10,000 BOPD in 2012, Marathon Petroleum operates a 68,000 BOPD refinery in Mandan, ND. The refinery receives its light sweet feedstock through a network of pipelines in the Williston Basin. Products generated at the refinery are distributed directly from a truck rack at the facility or through the NuStar North Pipeline to Eastern North Dakota and Minnesota.

In 2017, Tesoro Corporation changed its name to Andeavor. In the second half of 2018, Andeavor merged with Marathon Petroleum and will operate under the Marathon Petroleum name.

**Marathon Petroleum Dakota Prairie Refinery:** In late June 2016, Tesoro Corporation purchased the Dakota Prairie Refinery from MDU Resources Group and Calumet Specialty Products Partners. The Dakota Prairie Refinery, began processing 20,000 BOPD at its facility just west of Dickinson, ND in May 2015. The “diesel topping” refinery produces around 7,000 BPD of diesel fuel for consumption, while the remaining product is transported for further processing or use.

In 2018, a decision was made to convert the refinery to produce renewable diesel fuel by late 2019. After 2019, the facility will no longer use crude oil as a feedstock. Renewable diesel fuel is likely to be shipped by rail and marketed in California.

In 2017, Tesoro Corporation changed its name to Andeavor. In the second half of 2018, Andeavor merged with Marathon Petroleum and will operate under the Marathon Petroleum name.

**Davis Refinery:** Meridian Energy Group is planning to construct a crude oil refinery in Billings County, east of the Fryburg Rail Facility in Belfield. The refinery is designed with an inlet oil capacity of 49,500 BPD. All refined products are expected to be marketed regionally with transportation taking place by truck and/or rail. Site preparation began in July 2018 with plant completion expected in 2020.

*A map of North Dakota crude oil gathering systems can be found in Appendix C*

**Rail Loading Facilities:** The transportation of crude oil by rail car has played a key role in moving growing volumes of crude oil from the Williston Basin to markets around the United States and Canada. Figure 6 shows the estimated Williston Basin market share percentages for rail, pipeline, and local refining. Figure 7 shows the estimated volume of oil moved by rail out of North Dakota. Maps, capacities, and additional information on the various facilities can be found on the Pipeline Authority websites.

A significant decrease in crude by rail volumes can be identified during the 2015-2017 timeframe in Figures 6 & 7. The 2015-2017 volume decrease can be attributed to production declining in North Dakota and reduced market incentives to utilize crude by rail. In 2018, the downward trend reversed as production reached record levels and market pricing at coastal refining centers incentivized the use of crude by rail from North Dakota. The Pipeline Authority estimates eleven of the twenty-plus rail facilities are still active, with the most active facilities being those with unit train loading capabilities and inbound/outbound marketing options.

The future of crude by rail utilization in North Dakota will be driven by oil production volumes, market pricing, pipeline capacity, and regulatory oversight.

*A map of North Dakota oil rail loading facilities can be found in Appendix D*

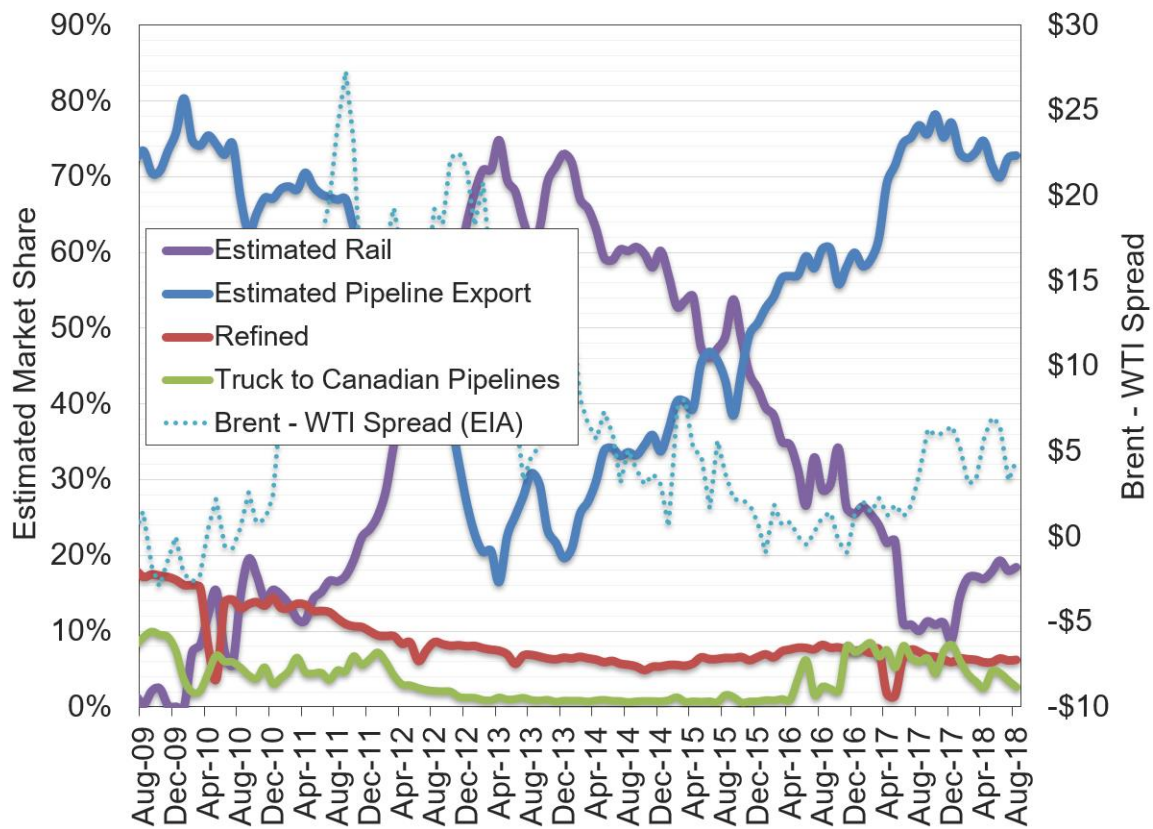


Figure 6. Estimated oil transportation by mode (Aug. 2018 data)

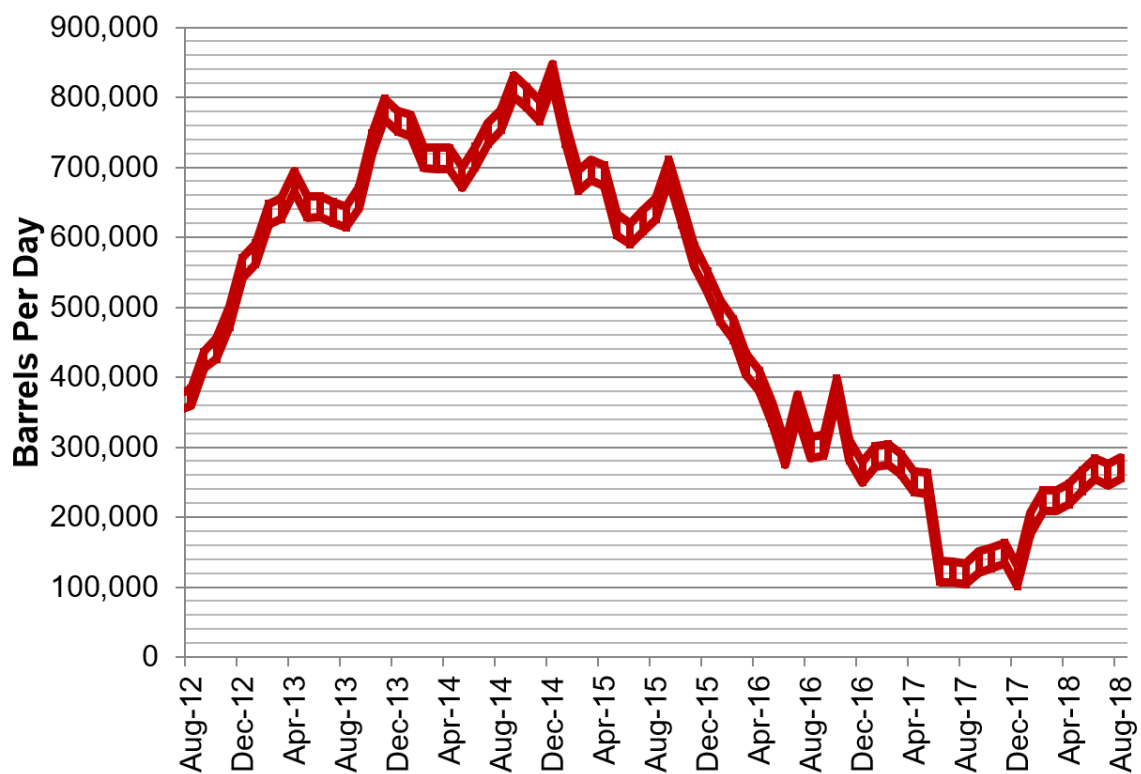


Figure 7. Estimated outbound crude oil rail shipments (Aug. 2018 data)

## **Natural Gas Pipelines**

**Alliance Pipeline:** The Alliance Pipeline is a high pressure, large diameter natural gas pipeline that originates in British Columbia, Canada and terminates at the Aux Sable gas processing plant near Chicago, IL. The Alliance Pipeline transports “dense gas” or gas that still contains high BTU natural gas liquids, such as propane and butane. In February 2010, the Alliance Pipeline began transporting rich natural gas from North Dakota via a new interconnect with the Prairie Rose Pipeline near Bantry, ND (See Aux Sable below). The 36 inch diameter United States portion of the pipeline has a certified capacity of 1.513 billion cubic feet per day (BCFD). The Alliance Pipeline has one existing North Dakota delivery point in Hankinson and one upcoming interconnect with Montana Dakota Utilities to serve industrial manufacturing in Gwinner.

In response to growing natural gas production, Alliance Pipeline announced plans on June 22, 2011, to construct a new, 80 mile, natural gas pipeline from the Hess Gas Plant in Tioga, ND to an interconnection point near Sherwood, ND. Commissioned in late 2013, the “Tioga Lateral Pipeline” has the ability to deliver liquids rich, high BTU, natural gas to Chicago, IL for further processing and transportation. The Tioga Lateral has the capacity to transport up to 126 MMCFD.

**Northern Border:** The Northern Border Pipeline, owned by TC Pipelines and ONEOK Partners, is a 1,249 mile pipeline originating at the Port of Morgan in Montana and terminating near North Hayden, Indiana. The pipeline has a system receipt capacity of 2.37 BCFD, with roughly half of the gas supply in 2018 originating in Canada through a receipt point with the Foothills Pipeline at the Port of Morgan. The 42 inch diameter Northern Border Pipeline receives gas deliveries at a total of seventeen receipt points in the Williston Basin with fourteen of those points for North Dakota gas supply.

**WBI Energy Transmission:** Formerly known as Williston Basin Interstate Pipeline Co., WBI Energy Transmission operates more than 3,700 miles of natural gas transmission pipelines throughout North Dakota, Montana, Wyoming, and South Dakota. This network of pipelines plays a vital role in North Dakota’s natural gas industry. It contains twelve interconnecting points with other regional pipelines and can also deliver natural gas to local distribution companies or natural gas storage fields. WBI continues to make system upgrades in western North Dakota in order to meet growing customer demand.

In June 2016, WBI announced an open season to connect the eastern North Dakota portion of the system with the Viking Pipeline in western Minnesota. This project, known as the Valley Expansion, does not directly support North Dakota gas production volumes, but rather would serve to provide additional gas volumes to consuming markets in eastern North Dakota. The Valley Expansion project is expected to be operational in the fourth quarter of 2018.

**Aux Sable:** In June 2011, Aux Sable announced the acquisition of the Prairie Rose Pipeline and condensate recovery facility near Stanley, ND. Originally constructed by Pecan Pipeline, the 75 mile, 12 inch system went into service February 2010 and has the capability to transport over 100 MMCFD of unprocessed natural gas from Mountrail County to an interconnect with the Alliance Pipeline near Bantry, ND.

**Bison Pipeline:** TransCanada placed the 302 mile, 30 inch Bison Pipeline into service in early 2011. The pipeline was built to connect natural gas production in the Powder River Basin of Wyoming to the Northern Border Pipeline in Morton County North Dakota. The pipeline has an initial capacity of 407 MMCFD and could be expanded to 1 BCFD.

### **Natural Gas Liquids Pipelines**

**ONEOK Bakken NGL Pipeline:** On July 26, 2010, ONEOK Partners announced plans to construct a new 12 inch natural gas liquids pipeline capable of moving 60,000 BPD from existing and planned facilities in the Williston Basin to an interconnect with the Overland Pass Pipeline near Cheyenne, WY. The “Bakken NGL Pipeline” was built to address the high volumes of natural gas liquids that are extracted from the rich Bakken gas during processing. The pipeline operates as a Y-grade system, with product fractionation taking place in Bushton, KS. ONEOK announced completion of the pipeline in April 2013 and an expanded capacity of 135,000 BPD in September 2014.

In February 2018, ONEOK announced a new NGL transmission system known as the Elk Creek Pipeline. The \$1.4 billion project could initially connect 240,000 barrels per day of NGLs from the Williston Basin to further NGL infrastructure in Kansas. This project could be expanded up to 400,000 barrels per day. Construction of the pipeline began in 2018 and is expected to be complete by the end of 2019.

**Vantage Pipeline:** On July 15, 2010, Mistral Energy announced a new 430 mile liquid ethane pipeline from Tioga, ND to Empress, AB. With an initial capacity of 40,000 BPD, the new “Vantage Pipeline” was built to address the high concentration of ethane found in North Dakota’s natural gas. Placed into service Q2 2014 in conjunction with the Hess Tioga Gas Plant Expansion, the pipeline was constructed of 10 inch pipe. In September 2014, Pembina Pipeline Corporation purchased the Vantage Pipeline from Mistral Midstream.

On February 10, 2015, Pembina Pipeline announced that the Vantage ethane pipeline would expand to connect to ONEOK’s Stateline plants with 50 miles of 8” pipeline. The \$85 million system expansion also included taking the existing mainline capacity from 40,000 bpd to 65,000 bpd. Ethane deliveries from the ONEOK Stateline plants to Vantage began in May 2017.

### **Carbon Dioxide Pipelines**

North Dakota continues to have only one carbon dioxide pipeline in service. The Dakota Gasification Company’s, 12-14 inch, 205 mile pipeline went into service in 2000 and transports roughly 150 MMCFD of carbon dioxide to oilfields near Weyburn, SK.

Two carbon dioxide pipeline projects are under development. One system would be operated by Denbury Resources and would connect the Cedar Creek Anticline oilfields in eastern Montana and southwest North Dakota to the existing Greencore Pipeline at Bell Creek, MT. The 110 mile, \$150 million, extension is anticipated to be complete by 2020. The second project under development is part of Project Tundra’s



plan to collect carbon dioxide from the Milton R. Young Station and transport it to the Williston Basin for either sequestration and/or enhanced oil recovery. If approved, a pipeline carrying carbon dioxide from the Young Station could be in service by the early 2020's.

The Pipeline Authority continues to work with interested parties on the development of new carbon dioxide pipelines for capture and sequestration, as well as enhanced oil recovery operations. The Pipeline Authority is an active member of the Plains CO<sub>2</sub> Reduction Partnership through the Energy and Environmental Research Center in Grand Forks, ND.

## **Natural Gas Processing**

*For reference, a North Dakota Gas Processing and Transportation map can be found in Appendix E*

### **New or Expanding Natural Gas Plants**

Due to the vast footprint of the Bakken resource, natural gas gathering and processing operators in North Dakota have faced difficult challenges in the past to keep pace with faster, more efficient drilling and completion techniques. Despite the daunting task, industry is rising up to reap the great economic reward contained in the rich Bakken gas.

North Dakota currently has twenty nine natural gas processing/conditioning plants operating, with the capability to process roughly 2.2 BCFD. Eight additional new or expanded plants are expected in 2018-2020 and will add 1.145 BCFD of processing capacity (Figure 8). A detailed breakdown of the existing and proposed facilities can be found on the Pipeline Authority website.

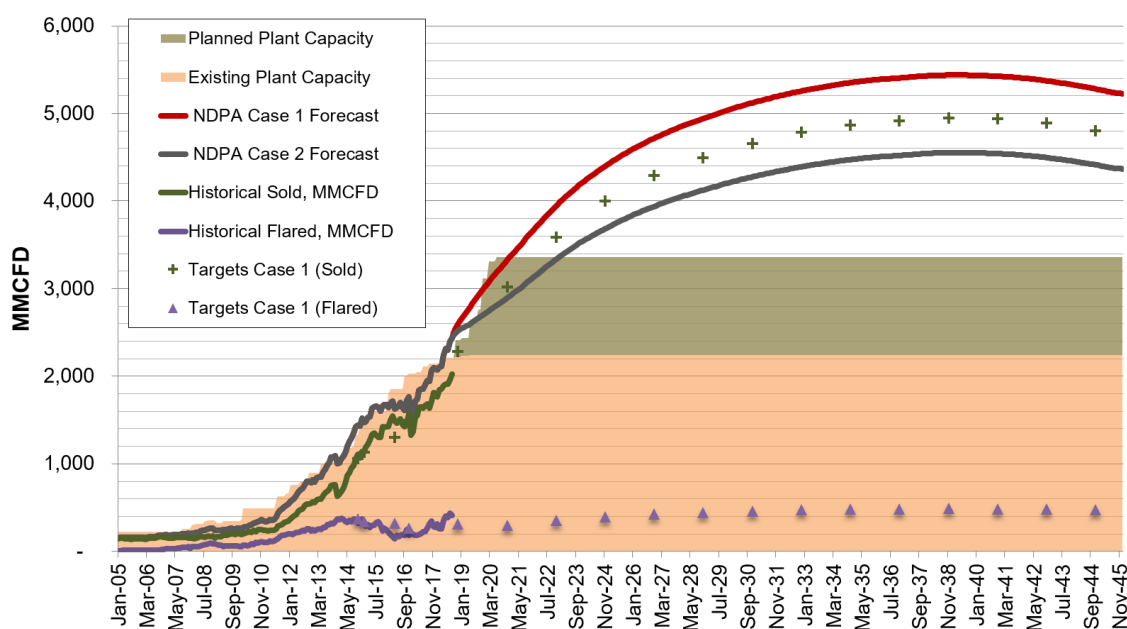


Figure 8. North Dakota natural gas processing plant intake capacity, gas production, gas forecast, and NDIC capture targets. (Forecast starts in Aug. 2018)

## **Planned Activities**

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Over the past year, the Pipeline Authority has continued to experience great success by working with industry to quantify future crude oil and natural gas production in order to provide the assurance needed to move forward with various expansion projects. The forecasted petroleum production levels will continue to be updated to reflect oil price forecasts from the U.S. Energy Information Administration. The Pipeline Authority will continue to utilize new and existing development information to gain a deeper understanding of the crude oil, natural gas, natural gas liquids, and carbon dioxide pipeline needs in Williston Basin.

Industry and public information distribution will continue with the use of newsletters, presentations, monthly updates, and agency websites. The Pipeline Authority will continue to conduct information presentations to public audiences, legislative groups, and industry representatives at various events throughout the coming year.

## APPENDIX A

North Dakota Pipeline Authority's *Pipeline Publication* Newsletter



# the PIPELINE publication

Volume 8 ♦ Issue 2  
August 2017

## INDUSTRIAL COMMISSION OF NORTH DAKOTA PIPELINE AUTHORITY

**Governor**  
Doug Burgum

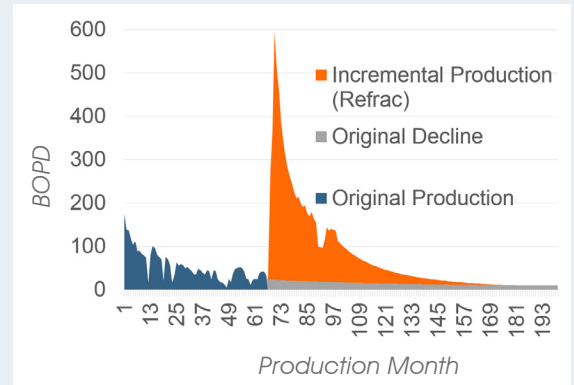
**Attorney General**  
Wayne Stenehjem

**Agriculture Commissioner**  
Doug Goehring

**Director**  
Justin J. Kringstad

## A LOOK AT REFRACS IN NORTH DAKOTA

The process of recompleting, or refracing, an existing Bakken – Three Forks well may be the next big step to increase oil and gas recovery rates in the state. A refrac is the practice of hydraulic fracturing an existing well that has already been hydraulically fractured at some earlier time period. Refracs are not new to the industry, as there is significant experience over the last decades around the world. However, due to the relatively young nature of Bakken development, the technique has had limited testing in the region.



During the first half of 2017, the Pipeline Authority conducted research to determine what data exists on refracs in the state. Just over 140 wells were identified as being refraced over the last several years.

The data revealed the following points of interest:

- Typical wells targeted for refrac were between four and five years old and utilized completion techniques now considered outdated.
- Almost half of the refraced wells were in Dunn County.
- On average, the production of the well after the refrac was higher than the original well performance.
- There were examples found where the refraced wells did not perform significantly better after refracing.
- The Pipeline Authority has identified almost 2,000 wells drilled between 2007-2011 that are positioned to be potential refrac candidates in the near future.
- Of the wells examined, none were refraced more than once, a practice that is not uncommon outside of North Dakota.

## NORTH DAKOTA — Production Numbers

¶ [www.pipeline.nd.gov](http://www.pipeline.nd.gov)

### Average Daily Oil Production, BOPD

Apr. 17	May. 17	Jun. 17
1,050,476	1,040,995	1,032,495

### Average Daily Gas Production, MMCFD

Apr. 17	May. 17	Jun. 17
1,836	1,854	1,850

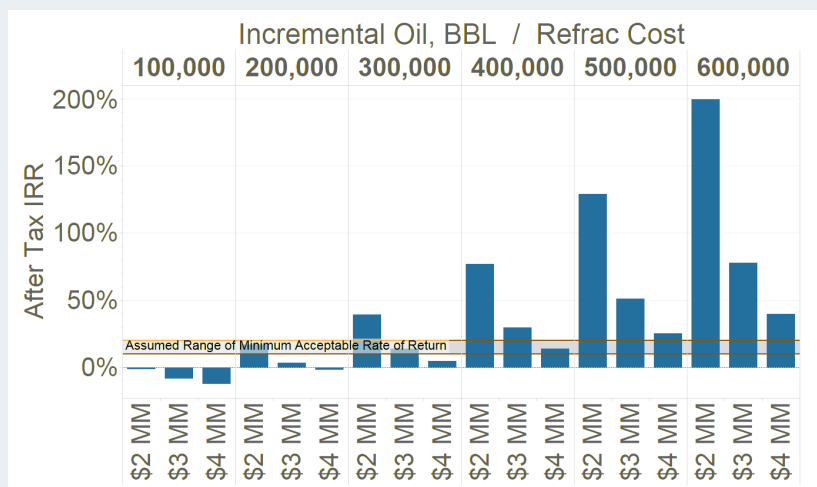
### Average Rig Count

Apr. 17	May. 17	Jun. 17
50	50	55

As of August 14, 2017, there are 57 active rigs in North Dakota.

## ECONOMICS OF REFRACS

The Pipeline Authority performed a high level exercise to try and determine the economics of refracing using incremental oil and gas production as the guide. As seen in the sample refrac production chart (front page), the orange colored production can be considered incremental production due to the refrac operation around month 68. In this example, the well is estimated to have 250,000+ barrels of incremental oil production from the refrac. The bar chart is a guide created to understand the economics of refracing in a \$40/bbl (wellhead) price environment. The economics were run using 100,000-600,000 barrels of incremental production and refrac costs of \$2-\$4 million.



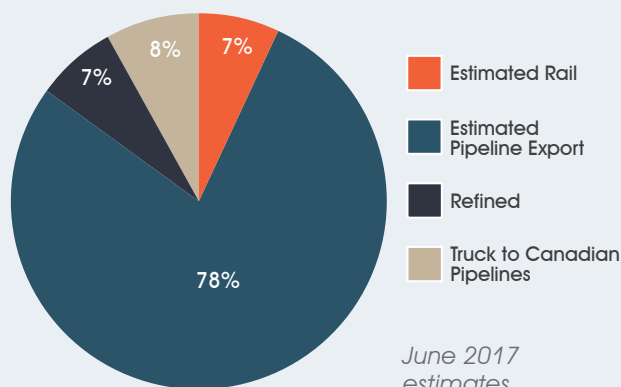
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600 E. Boulevard Ave. Dept. 405  
Bismarck, ND 58505-0840

### NEXT STEPS

Refracs have the potential to significantly alter the production profile for wells in the state. The Pipeline Authority is going to continue working to better understand how local and statewide transportation needs shift in the case that hydraulic fracturing crews are added or reallocated to refrac operations. More detailed information on the topic of refracs is available on the "Presentations" page of the NDPA website.

### Estimated Williston Basin Oil Transportation



### North Dakota Pipeline Authority

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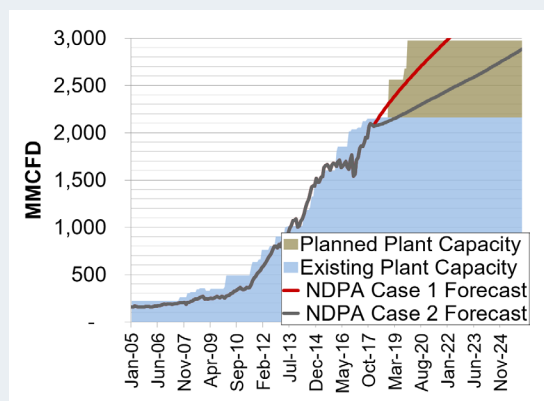


# the PIPELINE publication

Volume 9 ❖ Issue 1  
March 2018

## FULLY ADDRESSING NORTH DAKOTA'S GAS CAPTURE NEEDS

In order to fully address natural gas capture requirements in North Dakota, there are three major categories of infrastructure that need to be in place. The first, and arguably the most pressing, is the construction of gas gathering pipelines that provide transportation from the wellhead to a gas processing plant. During the early years of Bakken development, the pace at which new wells were being drilled was faster than the gas gathering community could plan and construct the required pipeline infrastructure. Largely through better producer-gatherer communication and planning, the number of wells being connected to gas gathering pipelines each month keeps pace with new producing wells.



The second category of infrastructure that needs to be in place is gas processing. Currently, North Dakota has the ability to process

2,150 million cubic feet per day (MMCFD). The processing industry has responded to expected gas production growth with plans to construct or expand five processing facilities in the state. These five projects would increase North Dakota's processing capabilities to 2,965 MMCFD by the end of 2019. The included chart provides a visual reference for existing (blue) and planned (brown) gas processing capacity. The chart also includes historical gas production

and two of the Pipeline Authority's forecast scenarios that clearly show the need for expanded processing capacity in the region. Not shown in the chart is the expectation for gas production to reach 3,500 – 4,500 MMCFD in the coming decades, requiring even further processing capacity in 2020 and beyond.

Transmission pipeline capacity is the third category of infrastructure that needs to be in place to adequately address gas capture. The transmission category can be separated further into "dry" or "residue" gas transmission and natural gas liquids (NGL) transmission.

The most immediate gas capture transmission need for the state is NGL capacity. One industry solution proposed to address NGL capacity constraints is the ONEOK Elk Creek pipeline. The \$1.4 billion project (map included) could initially connect 240,000 barrels per day of NGLs from the Williston Basin to further NGL infrastructure in Kansas (expandable to 400,000 barrels per day).



The dry gas transmission pipeline network is currently the least pressing issue facing the gas capture supply chain. However, in the next 7-10 years, the NDPA expects dry gas production from the region's processing facilities to exceed the existing transmission pipeline capacity, requiring additional capacity to be added with new or expanded transmission systems.

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## NORTH DAKOTA — Production Numbers

### Average Daily Oil Production, BOPD

Nov. 17	Dec. 17	Jan. 18
1,196,976	1,182,836	1,175,638

### Average Daily Gas Production, MMCFD

Nov. 17	Dec. 17	Jan. 18
2,096	2,085	2,068

### Average Rig Count

Nov. 17	Dec. 17	Jan. 18
54	52	56

*As of March 22, 2018, there are 60 active rigs in North Dakota.*

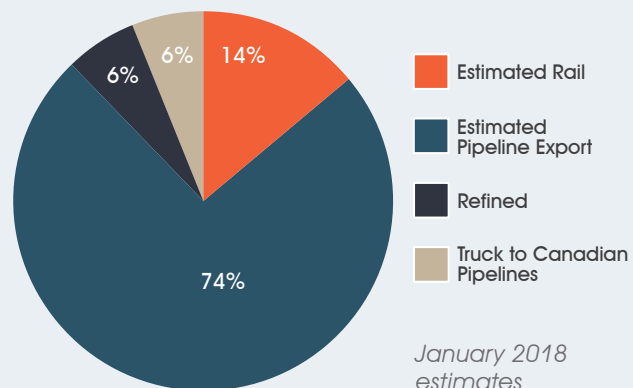
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### FACTOID

Recent work by the NDPA revealed that higher oil prices in 2018 means that roughly 44% more geographic area in ND could be targeted for development than a year ago. One interesting development to watch will be the application of new technology in portions of the Williston Basin that have not seen development activity since the slowdown. For more details and new maps showing the updated NDPA breakeven analysis, please visit the "Presentations" page on our website.

### Estimated Williston Basin Oil Transportation



January 2018 estimates



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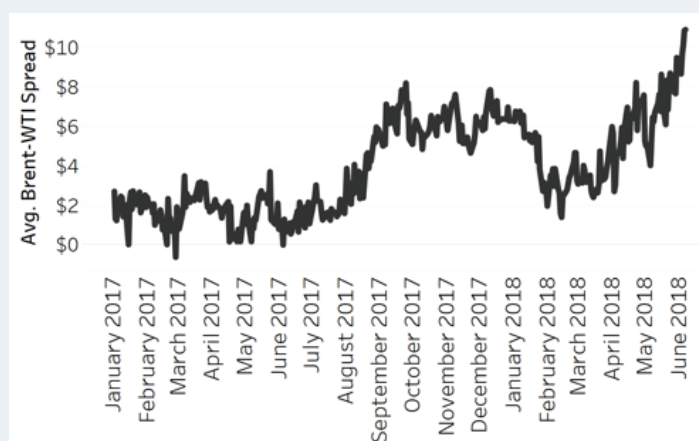
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## MARKET PRICES INCENTIVIZING CRUDE BY RAIL

Since late 2017, the oil industry has experienced a series of events causing the two most watched oil price markets diverge from one another once again. West Texas Intermediate or “WTI” pricing indicates the market value at Cushing, OK. Brent crude oil is the leading market indicator for global light, sweet crude oils. The price difference between these two markets is known as the Brent-WTI spread and sits just over \$10 per barrel in mid-June 2018. This spread in market values has been shown to drive marketing and transportation decisions for crude oil leaving North Dakota. When Brent markets are at least \$5-7 per barrel higher than WTI, North Dakota has historically experienced an increase in the utilization of crude by rail.



The utilization of crude by rail has decreased from an estimated peak in 2014 of over 800,000 barrels per day to a late-2017 estimated low of just over 100,000 BOPD. The 2014-2017 decrease in crude by rail movements from North Dakota was driven by decreasing regional production, increased pipeline capacity, and a relatively low market incentive due to a narrow Brent-WTI spread.

Since late 2017, North Dakota has experienced an uptick in crude by rail movements from the region. In April 2018, the Pipeline Authority estimates crude by rail from North Dakota was roughly 280,000 barrels per day.

With Dakota Access Pipeline going into service last year, North Dakota currently has enough capacity to theoretically move 100% of the oil to Midwest and Gulf markets via pipeline. The current increase has been primarily the result of market forces incentivizing deliveries of Bakken crude oil to the east and west coast refining centers that do not have pipeline access to domestic crude oil sources.

By the first half of 2019, North Dakota oil production is expected to outpace pipeline capacity once again. Once production exceeds the 1.37 million barrels per day of pipeline capacity, the use of crude by rail will transition from elective, and market driven, to required. Industry participants are actively pursuing additional pipeline capacity for future production growth. Two such projects include Energy Transfer Partners seeking shipper commitments to expand the Dakota Access Pipeline and TransCanada's proposal to move North Dakota crude oil on the Keystone XL pipeline from an injection point near Baker, MT.

In the coming decades, North Dakota is forecasted to produce 2-2.4 million barrels per day. Oil production at the forecasted levels would require pipeline expansions beyond the proposed Dakota Access Pipeline expansion and Keystone XL's Baker, MT onramp. For the remainder of 2018, it is expected that crude by rail volumes will continue to increase as result of market forces and in 2019 and beyond until additional pipeline capacity is added.

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# NORTH DAKOTA — Production Numbers

## Average Daily Oil Production, BOPD

Feb. 18	Mar. 18	Apr. 18
1,175,338	1,162,134	1,224,948

## Average Daily Gas Production, MMCFD

Feb. 18	Mar. 18	Apr. 18
2,107	2,120	2,242

## Average Rig Count

Feb. 18	Mar. 18	Apr. 18
57	59	60

*As of June 19, 2018, there are 61 active rigs in North Dakota.*

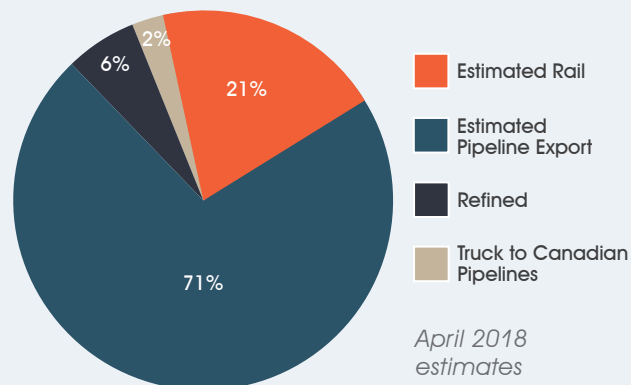
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## FACTOID

At the peak of crude by rail movements from North Dakota, there were at least 22 facilities loading rail cars for shipment. Facilities ranged from sophisticated unit train facilities with pipeline and truck receipt options to small facilities that would use simple transfer pumps to unload truck deliveries into rail cars. It is estimated that at time of writing, only eight facilities are still actively loading crude oil for shipment.

### Estimated Williston Basin Oil Transportation



April 2018 estimates



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## APPENDIX B

### North Dakota Pipeline Maps

# North Dakota Crude Oil Pipelines

This map illustrates the extensive network of crude oil pipelines across North Dakota, connecting various oil fields to refineries and interstate highways. The state is divided into counties, each labeled with its name. The pipelines are color-coded to represent different companies or systems. Key features include:

- Refineries:** Indicated by black icons, with labels for Dakota Prairie and Tesoro.
- Pipelines:** Represented by colored lines, including the Keystone Pipeline (pink), Bakken Oil Express (purple), and others.
- Counties:** Labeled counties include Divide, Burke, Renville, Bottineau, Rolette, Towner, Cavalier, Pembina, Williams, Mountrail, Ward, McHenry, Pierce, Ramsey, Walsh, Nelson, Grand Forks, McKenzie, Eddy, Benson, Foster, Griggs, Steele, Traill, McLean, Sheridan, Wells, Mercer, Dunn, Oliver, Burleigh, Kidder, Stutsman, Barnes, Cass, Golden Valley, Stark, Slope, Hettinger, Grant, Sioux, Emmons, Logan, LaMoure, Ransom, Richland, Bowman, Adams, McIntosh, Dickey, and Sargent.

**Legend:**

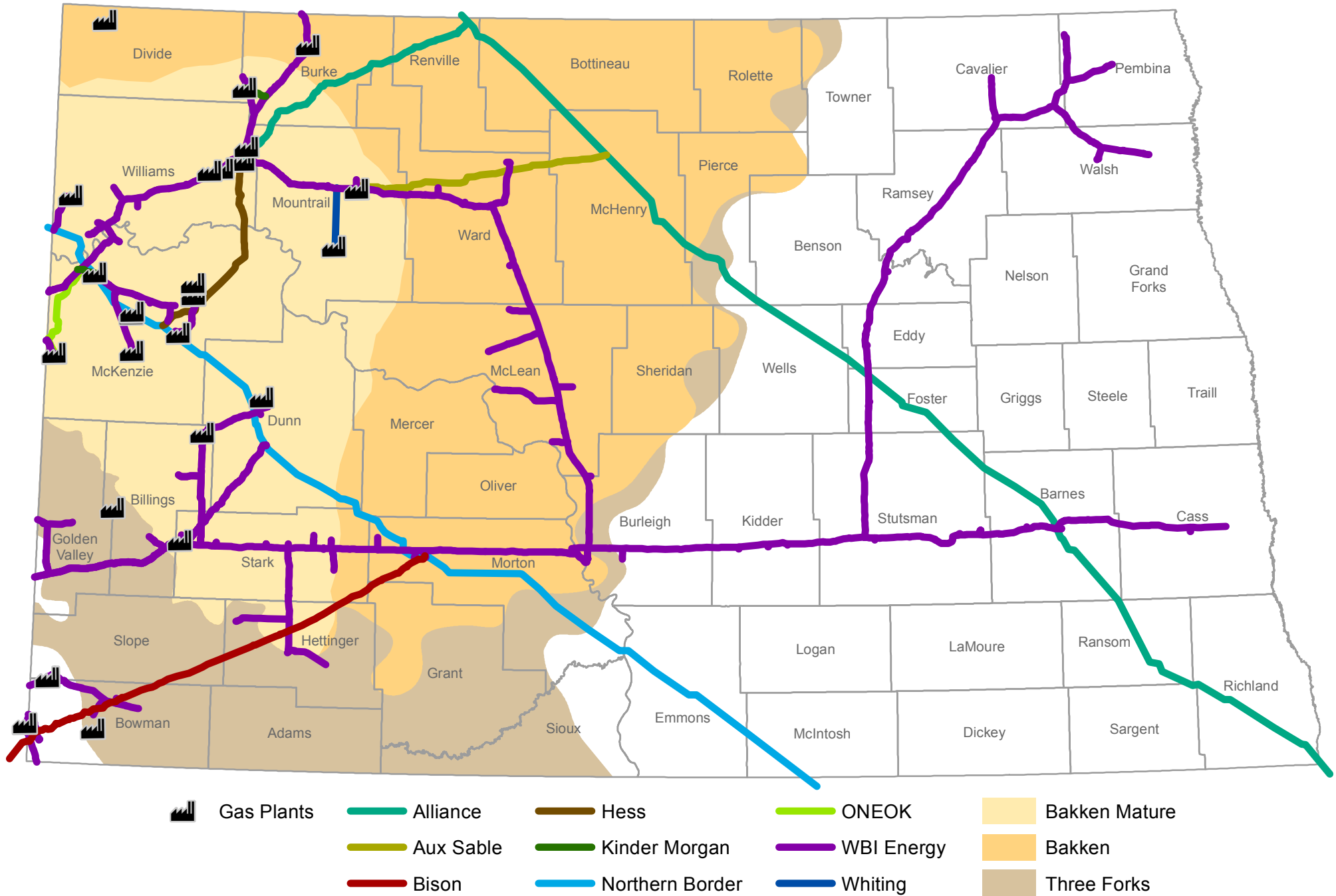
Refinery	Basin Transload	Butte	Double H	Hiland	Plains
Bakken Oil Express	Belle Fourche	Crestwood	Enbridge	Keystone Pipeline	Targa
BakkenLink	Bridger	Dakota Access	Four Bears	Little Missouri	Tesoro

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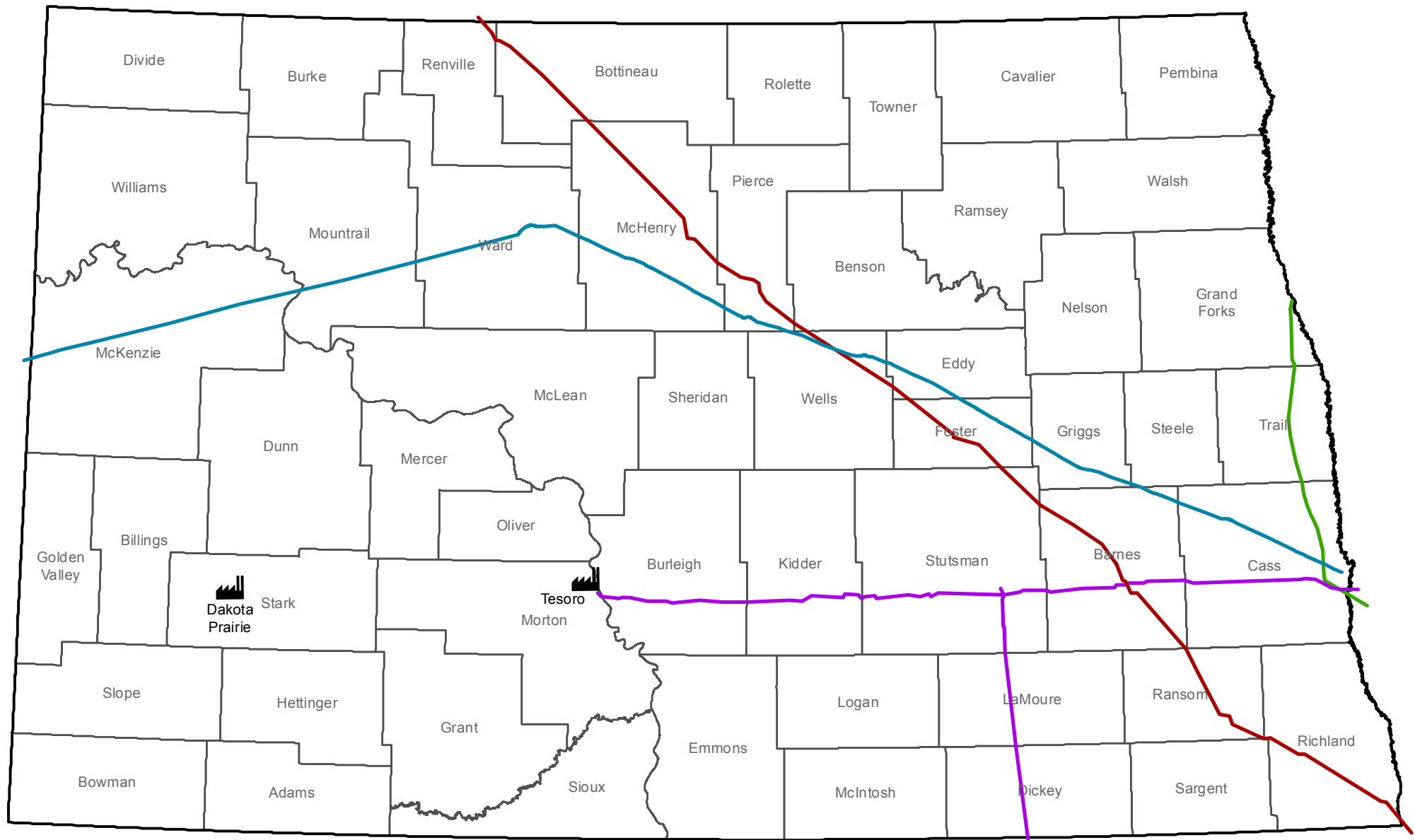
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# North Dakota Natural Gas Pipelines



# North Dakota Products Pipelines

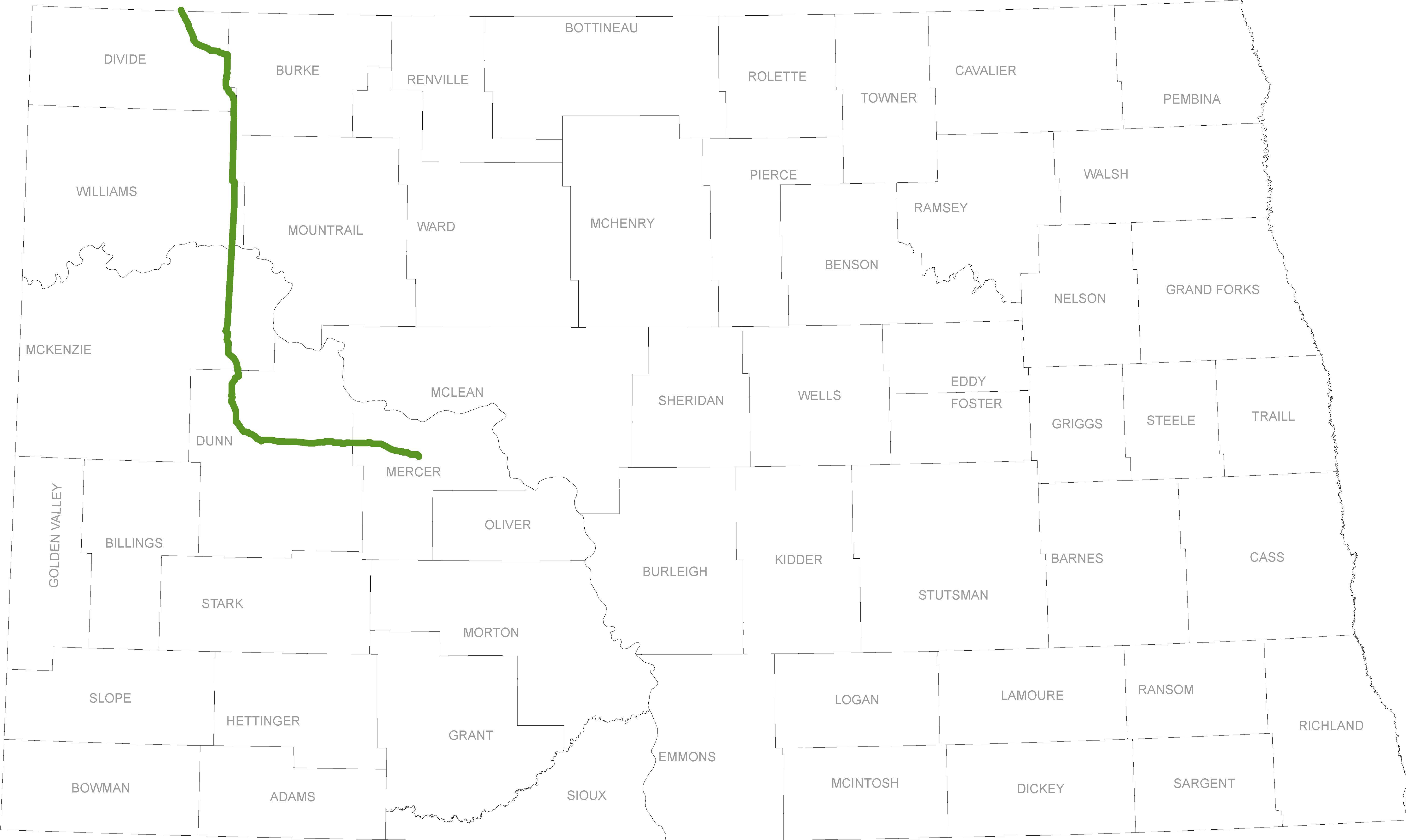


— Cenex Pipeline LLC - Refined Products
 — Magellan Midstream Partners LP - Refined Products
 — Kinder Morgan Cochin - Condensate
 — NuStar Energy - Refined Products
  Refinery

Date: 7/13/2015

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# North Dakota CO<sub>2</sub> Pipeline



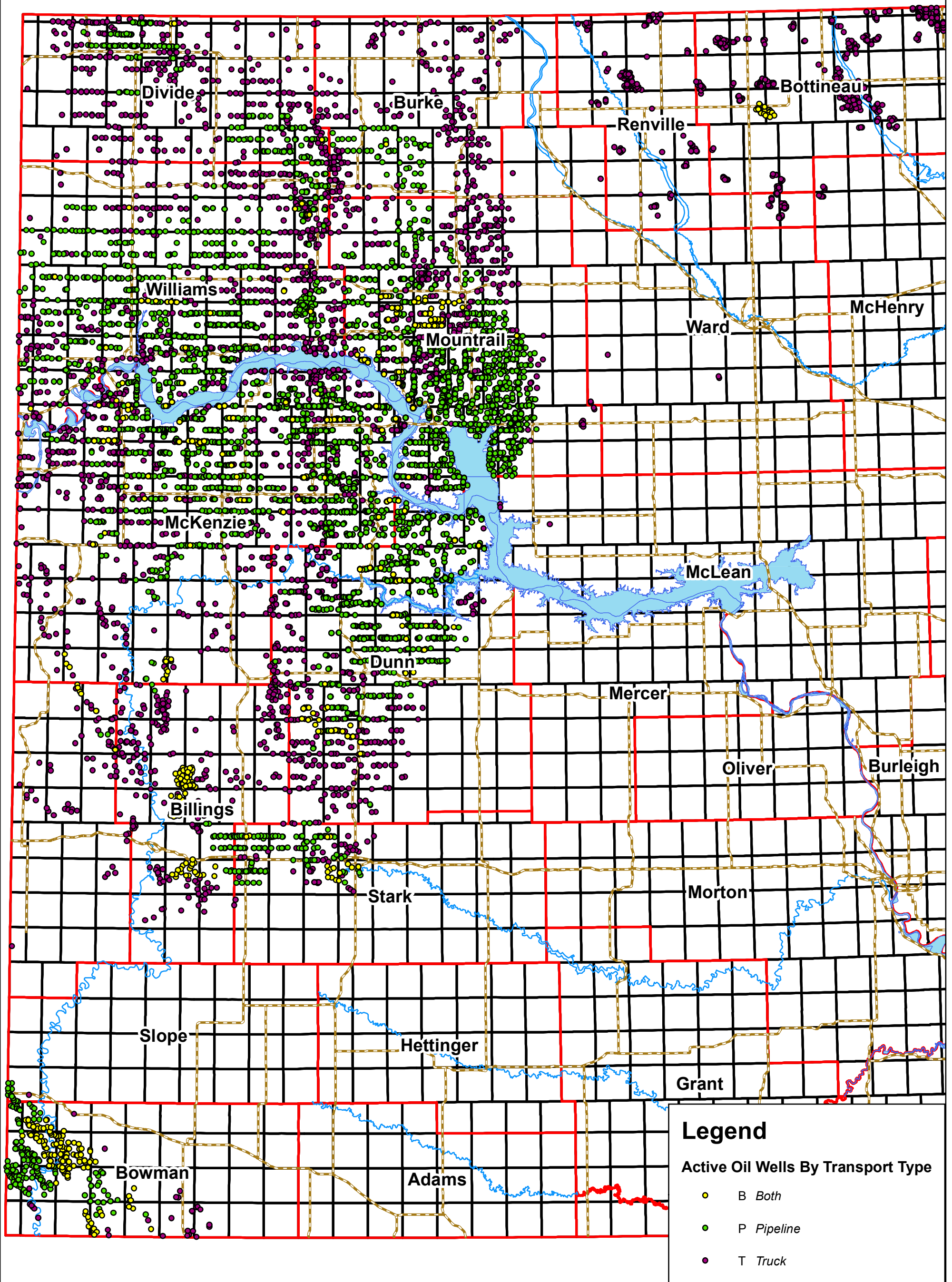
— Dakota Gas

## APPENDIX C

### North Dakota Crude Oil Gathering Map



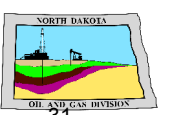
# Active Oil Wells By Transport Type



Map Data Date : 3/1/2017

Map Update Date : 9/13/2017

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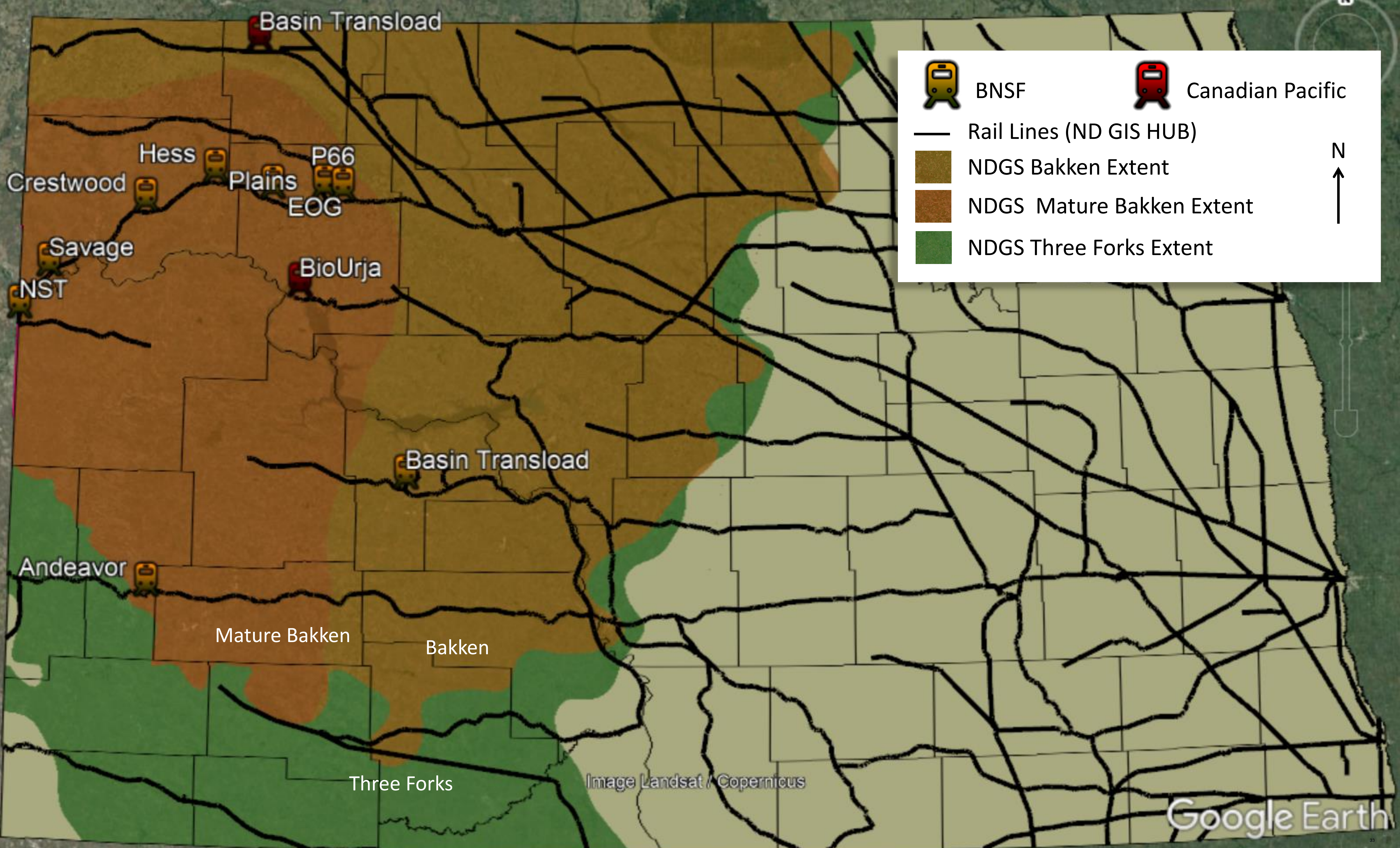
## APPENDIX D

### North Dakota Crude Oil Rail Loading Map



# North Dakota Crude Oil Rail Loading Facilities In Service

North Dakota Pipeline Authority – July 2018





## APPENDIX E

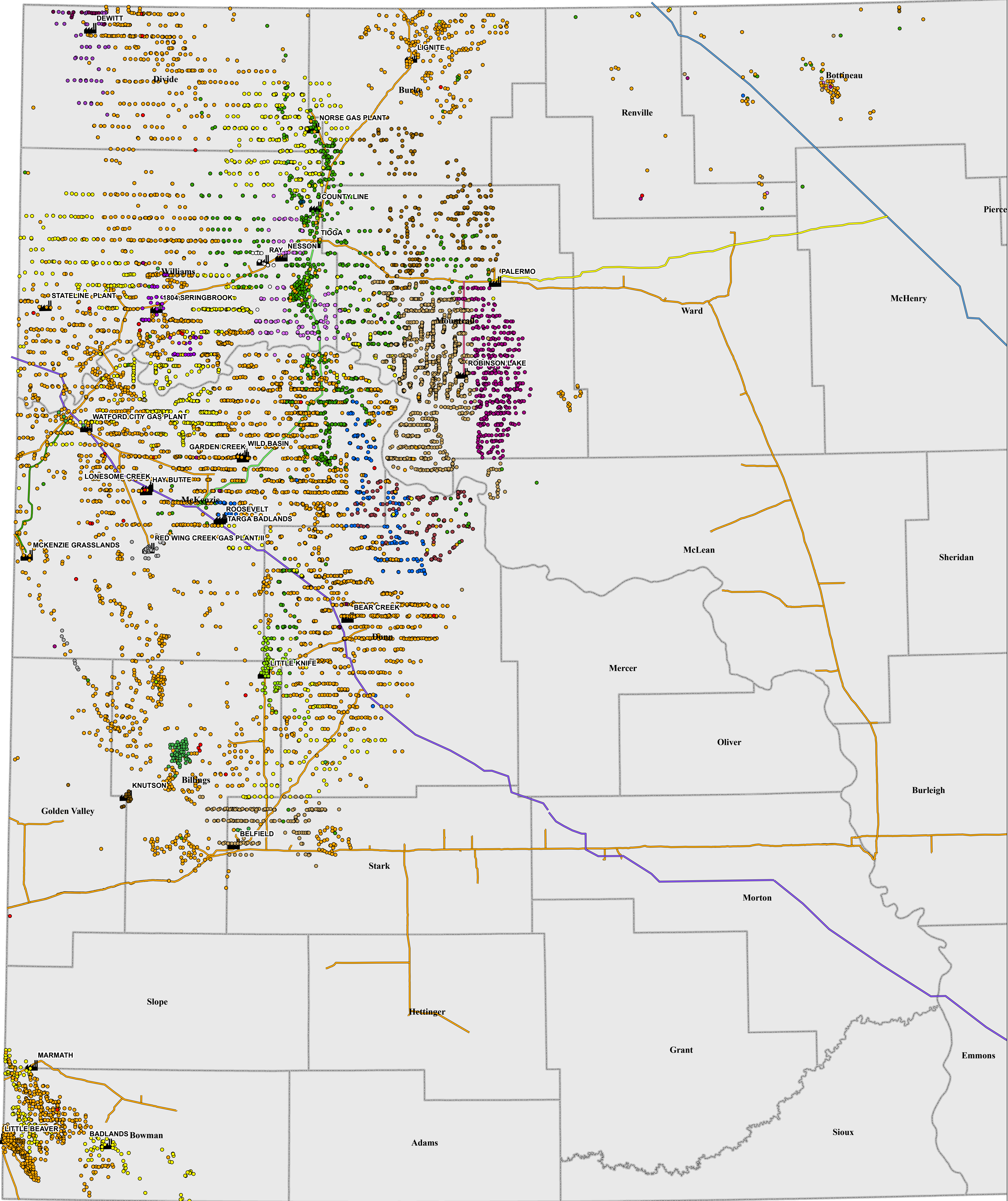
### North Dakota Gas Processing and Transportation Map



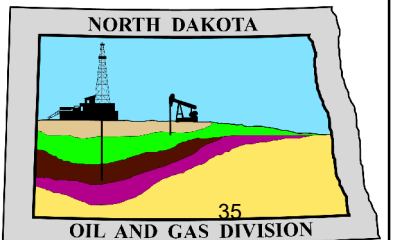
# DRAFT - North Dakota Gas - DRAFT

## Gas Gathering Reference Map

March 2018



Gatherer		Gas Plant
1804 LTD.	NEXTERA	Gas Plant
ANDEAVOR FIELD SERVICES LLC	ONEOK ROCKIES MIDSTREAM	<b>PIPELINE</b>
BISON MIDSTREAM, LLC	OTHER	Alliance
CRESTWOOD (ARROW) MIDSTREAM	PECAN PIPELINE (NORTH DAKOTA) INC	Aux Sable
HESS CORPORATION	PETRO-HUNT, L.L.C.	Bear Paw
HILAND PARTNERS HOLDINGS, LLC	TARGA BADLANDS LLC	Hess
LEGACY RESERVES OPERATING LP	TRUE OIL LLC	Northern Border
LIBERTY MIDSTREAM SOLUTIONS, LLC	USG MIDSTREAM BAKKEN I LLC	Whiting
NESSON GATHERING SYSTEMS, LLC	WESTERN GAS PROCESSORS	WBIP
	WHITING OIL AND GAS CORPORATION	



Date: 3/2/2018  
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