MINNESOTA ENVIRONMENTAL QUALITY BOARD

Wednesday, December 16, 2015

Meeting Location: MPCA Board Room
520 Lafayette Road North
St. Paul, Minnesota 55155
1:00 p.m. – 4:00 p.m.

ATTENTION
Please see attached map for building entrance and visitor parking.

AGENDA

I. *Adoption of Consent Agenda
Proposed Agenda for December 16, 2015, Board Meeting
November Meeting Minutes

II. Introductions

III. Chair's Report

IV. Executive Director's Report

V. Interagency Report on Oil Pipelines

VI. Pipeline Project Update

VII. Adjourn

Note: Items on the agenda are preliminary until the agenda is approved by the board.

This agenda and schedule may be made available in other formats, such as Braille, large type or audiotape, upon request. People with disabilities should contact Elizabeth Tegdesch, Board Administrator, as soon as possible to request an accommodation (e.g., sign language interpreter) to participate in these meetings.

MINNESOTA ENVIRONMENTAL QUALITY BOARD

Wednesday, December 16, 2015

Meeting Location: MPCA Board Room
St. Paul, Minnesota
1:00 p.m. – 4:00 p.m.

ANNOTATED AGENDA

General
This month's meeting will take place in the MPCA Board Room at 520 Lafayette Road in St. Paul. The EQB board meeting will be available via live stream on December 16 from 1:00 p.m. to 4:00 p.m. You will be able to access the webcast on our website: www.eqb.state.mn.us

The Jupiter Parking Lot is for all day visitors and is located across from the Law Enforcement Center on Grove Street. The Blue Parking Lot is also available for all day visitors and is located off of University and Olive Streets.

I. *__Adoption of Consent Agenda__
Proposed Agenda for December 16, 2015 Board Meeting
November Meeting Minutes

II. **Introductions**

III. **Chair's Report**

IV. **Executive Director's Report**

V. **Title:** Interagency Report on Oil Pipelines

Presenter: Courtney Ahlers-Nelson, Environmental Quality Board
651-757-2183

Materials Enclosed: Interagency Report on Oil Pipelines – final draft

Background: The Interagency Pipeline Coordination Team (Team) has prepared an Interagency Report on Oil Pipelines (Report). The team, comprised of eleven agencies and boards (Environmental Quality Board, Department of Commerce, Department of Transportation, Department of Employment and Economic Development, Department of Natural Resources, Pollution Control Agency, Board of Soil and Water Resources, Department of Agriculture, Department of Health, Department of Revenue and the Department of Public Safety), formed to coordinate state resources and expertise on issues related to the increase in oil transported by way of pipelines across Minnesota.

The Team assembled this Report to serve as an information resource for the general public and policy makers. The Report explores four key areas related to the movement of oil across the state in the Report,

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* *Items requiring discussion may be removed from the Consent Agenda*
** *Denotes a Decision Item*

including the economics of oil transportation, environmental and human health impacts, spill prevention, preparedness, emergency response and safety and pipeline approvals. After the initial presentation of the draft Report to the Board in March 2015, the Report was available for public comment between March 5, 2015 and June 1, 2015. The substantive comments that were received in that time are summarized at the end of each chapter and in some cases resulted in changes to the Report.

The presentation to the board will include a summary of each of the four areas and the changes made to the Report since the conclusion of the public comment period.

VI. Title: Current Proposed Pipeline Projects in Minnesota

Presenters Bill Grant, Minnesota Department of Commerce Deputy Commissioner
651-539-1801

Materials enclosed: None

Background: Background: Multiple pipeline projects have been initiated in Minnesota and the Department of Commerce plays a unique role in conducting environmental review of the projects where necessary. The Department will provide information on the permitting and environmental review process for at least two of the proposed pipelines considered by the Public Utilities Commission.

VII. Adjourn

MINNESOTA ENVIRONMENTAL QUALITY BOARD
MEETING MINUTES

Wednesday, November 18, 2015
MPCA Room Board Room, 520 Lafayette Road N, St. Paul

EQB Members Present: Dave Frederickson, Brian Napstad, Julie Goehring, Kristin Eide-Tollefson, Mike Rothman, Kate Knuth, John Saxhaug, John Linc Stine, Dr. Ed Ehlinger, Tom Landwehr, Erik Tomlinson, Sandy Rummel-Met Council

EQB Members Absent: Charlie Zelle, Matt Massman, Katie Clark-Sieben, Adam Duininck

Staff Present: Will Seuffert, Megan Eischen, Erik Dahl, Anna Henderson

I. Adoption of Consent Agenda and Minutes

II. Introductions

III. Chair's Report

Chair Frederickson shared briefly about his trip to Guadalajara, Mexico for the 24th Tri-national Accord with partners from the various states in Mexico and various provinces of Canada. He also mentioned the *Minnesota Prepares for the 2015 Paris Climate Conference* held at the Science Museum of Minnesota by the EQB. Many Board members attended.

The Board members shared brief overviews of activities regarding their agencies and/or the event at the Science Museum.

IV. Executive Director's Report

EQB initiated a *Good Cause Exempt Rulemaking* this week to move forward the changes that were required in the 2015 Special Session Law related to expanded trails. The judge will look at the rule; the comment period is brief and will close on November 25th. Depending on when we hear back, we are hoping to put the rule before the Board to approve and adopt in December.

EQB is planning a half day retreat in January for board members, staff, and technical representatives.

The December meeting will focus on pipeline issues; we intend to bring a final version for the report for approval and discuss some environmental review requirements related to the projects that are underway.

V. Minnesota's Water Industry Economic Profile

Presenter: Weston Merrick, Department of Employment and Economic Development

The report focused on four core water industry segments: water treatment, infrastructure and management, efficiency, and utilities.

VI. Management Analysis and Development Recommendations for the EQB

Presenter: Kristin Batson, Management Analysis and Development

The project consultant provided an overview of the assessment findings and recommendations.

VII. Silica Sand Update

Presenters: Erik Cedarleaf Dahl, EQB
Jeff Hedman, MPCA
Catherine Neuschler, MPCA
Heather Arends, DNR

The presentation covered a general update on silica sand activities in the state as well as updates on each agency's rules related to silica sand (MPCA, DNR, EQB).

VI. Adjourn

The audio recording of the meeting is the official record and can be found at this link: ftp://files.pca.state.mn.us/pub/EQB_Board/

Webcast is also available on the EQB website: https://www.eqb.state.mn.us/

Interagency Report on Oil Pipelines

An overview of the environmental, economic, human health, safety, and transportation infrastructure impacts as a result of increased crude oil pipelines in the state of Minnesota.

A report by the
Interagency Pipeline Coordination Team

MINNESOTA ENVIRONMENTAL QUALITY BOARD
EQB

Cover photo courtesy of Walter Haas

Contributors/acknowledgements

The Environmental Quality Board (EQB or Board) brings together leaders of nine state agencies, five citizens, and a representative of the governor. The Board reviews interagency issues that affect Minnesota's environment, advises policymakers, and creates long-range plans. Strategic planning and coordination activities are important EQB functions.

This *Interagency Report on Oil Pipelines* (Report) was prepared with assistance from 11 state agencies participating on an Interagency Pipeline Coordination Team (IPCT):

Environment Quality Board: Will Seuffert, Courtney Ahlers-Nelson and Denise Wilson

Department of Commerce: Bill Grant, Kate O'Connell, Doug Reiner, Deborah Pile, Raymond Kirsch and Laura Otis

Department of Agriculture: Santo Cruz, Bob Patton and Emily Jerve

Department of Transportation: Dave Christianson*, Peter Dahlberg

Department of Health: Michele Ross and David Bell

Pollution Control Agency: Stephen Lee*, Dorene Fier-Tucker, Bill Sierks, Patrice Jensen and Scott Lucas,

Department of Natural Resources: Steve Colvin and Jamie Schrenzel

Board of Water and Soil Resources: Dave Weirens and Les Lemm

Department of Employment and Economic Development: Neal Young and Weston Merrick

Department of Revenue: Jenny Starr and Jon Van Nurden

Department of Public Safety: Jon Wolfgram

*A special thank you to members of the ICPT that have retired since the first draft of this Report. Their years of experience and extensive knowledge helped ensure the Report was as comprehensive as possible.

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Introduction

The Interagency Pipeline Coordination Team (IPCT) includes technical and policy staff from 11 state agencies and was formed in 2014 with the goals of:

- Compiling all relevant state-level information related to pipeline transport of crude oil ("what we know").
- Sharing the information with the public and policy-makers.

These goals were substantively met through completion of the draft *Interagency Report on Oil Pipelines* (Report). The draft Report was available for public review from March 5, 2015 to May 31, 2015. The purpose for providing this information to the public was to gather input from a wide spectrum of stakeholder interests with a range of views about crude oil pipelines in Minnesota. During the public review period, letters were received from Minnesota citizens, nonprofit organizations, industry representatives, agricultural interests, a Minnesota State Representative, two Minnesota Chambers of Commerce, a Tribal Council, and a Native-led environmental organization.

These letters contained approximately 230 pages of suggested corrections, clarifications and additional information. The IPCT would like to thank everyone who took their time to review the draft Report and send recommendations for improvements. Comments received were carefully considered and, where appropriate, changes are reflected in the final version of this Report.

While much more information exists about crude oil pipelines, and other modes of oil transport, the IPCT agreed that the material provided in the draft Report gave the intended audience a sufficient, high-level overview of relevant information. In response to the comments received, some changes of note included in the final Report are as follows:

- The Executive Summary includes an issue statement at the beginning of each section that indicates information in each chapter of the Report.
- A more comprehensive background description that includes:
  - An historical background of federal and state regulatory authority for oil transportation.
  - The strategic position of Minnesota in national and international petroleum transportation.
  - The economic, technical, and environmental differences between modes of oil transport.
- A summary of public comments received during the comment period that are related to the topics in each chapter and suggestions for more study needed.

Other changes are primarily clarifications to better communicate the intended topic and correction of any typographical errors. The IPCT believes this Report is an important first step in a continuing discussion of crude oil pipeline-related issues in Minnesota

Executive summary

Minnesota is near two of the largest oil formations in North America — the Bakken fields of North Dakota, Montana and Saskatchewan, and the Alberta, Canada, oil sands. Crude oil extraction from these areas is contributing to an oil supply boom in North America.

In 2013, total Canadian crude oil production was approximately 3.5 million barrels per day. As of May 2014, Bakken crude production reached 1 million barrels per day. Oversupplied markets and weakening demand caused global oil prices to plummet. In the long term, if prices continue to decline, those prices will lead to declining production. However, in the short term, price fluctuations have had little impact on production, as the large capital investments by oil firms will take time to wind down.

There are two oil refineries located in Minnesota: Flint Hills Pine Refinery in Rosemount and Northern Tier Energy in St Paul Park. When most refineries were built nationally, in the last century, the greatest source of crude oil was Texas and the Gulf. Refineries were built near these locations as well as population centers in Chicago and on the East and West coasts. Now crude production has shifted into North Dakota and Canada, as well but the refineries remain where they have always been. Thus, the need to transport crude oil long distances, across multiple states to reach their ultimate destinations.

This Report focuses on four key areas that are important for a full assessment of potential benefits, impacts, and risks of crude oil transportation by pipelines:

- Economics of oil transportation
- Potential environmental and human health impacts
- Pipeline review process
- Spill prevention, preparedness, emergency response, and safety

Economics of oil transportation

This report discusses the economic and tax implications of pipelines transporting crude oil, as well as refined petroleum products, in and through Minnesota. Despite not having any of its own sources of oil, Minnesota is economically impacted as oil reserves are tapped for energy production. An estimated 2.7 million barrels of crude oil from the Bakken fields and Canada move across the state by pipeline each day. The existing 4,100 miles of crude oil and petroleum pipeline capacity in the state is not meeting the current demand for transport. The result is up to 600,000 barrels of oil per day have been moving through Minnesota by train. Rail and pipelines are not necessarily direct substitutions for each other, but rather act as complements.

The increase in shipping of Bakken crude oil by rail, and the resulting congestion, has hurt Minnesota's farming, mining, energy, retail, and manufacturing industries. Increased prices and delays have made it more difficult for producers to get inputs to maintain operations or send goods to market. Another major commodity, silica sand, has emerged due to the hydraulic fracturing of the shale oil beds of the Bakken and other fields to release oil and gas. While only a small percentage of rail traffic involves this bulk material shipment, it can be a significant — and growing — addition to the existing mix of rail traffic. Moreover, trains moving silica sand use the same main lines that handle the majority of crude oil and grain shipments, exacerbating the main points of congestion in the rail network.

While some industries are hurt by increased transportation, the proliferation of pipelines and railroads offer new sources of product for Minnesota industry suppliers. Nationally in 2012, there was demand for 9.6 million metric tons of oil and gas pipe products.

Construction and management of pipelines and railroads impacts the broader Minnesota economy. Jobs in these areas tend to produce above-average wages and have strong multiplier effects. Approximately $1 million in investment in construction of pipelines could result in about 13 direct and indirect jobs. One direct job in pipeline operations means approximately 1.6 additional jobs throughout the state. However, many of these construction projects are temporary, and the scale of construction and operations is small relative to the overall state economy.

Job gains are only one portion of the economic narrative. Minnesota must also weigh the ability of additional rail and pipeline construction to relieve congestion on transportation networks with the risk of adverse side effects (for example, personal, environmental, and economic damage related to construction and spills).

Taxes

There are three tax laws that have the most direct impact on pipelines transporting crude oil and refined petroleum products in and through Minnesota — property tax, sales tax, and corporate franchise tax.

Property tax

Property tax is levy-based and is imposed on that portion of the pipeline's taxable market value attributable to the portion of the pipeline located within the local jurisdiction. Pipelines are valued under a "dual" property tax system:

The Department of Revenue values the pipeline's operating property, which includes items like pipes and pumping stations.

Land or other real property owned by pipeline companies that is not part of the operating property is assessed locally by a city or county assessor.

Sales tax

Sales tax is a transactional tax that applies to Minnesota retail sales of taxable services and tangible personal property. Regarding pipelines, sales and use tax is generated primarily during the construction phase when the tangible personal property is purchased. For every $1 million of new pipeline construction expenditures, the taxable pipeline materials would be approximately $420,000, which could generate around $28,875 in sales and use tax revenue.

Corporate Franchise tax

Corporations that operate in Minnesota are subject to Minnesota's corporate franchise tax. There are about 14 unitary groups filing Minnesota corporate franchise tax returns that include pipeline activity within Minnesota.

Potential environmental and human health impacts

This Report provides a high-level overview of potential environmental and human health-related impacts that may result from an increase in crude oil pipeline siting around the State.

Many impacts are temporary and construction-related, while others can be long lasting and even permanent, putting human health and the environment at risk. Many of these impacts are evaluated and addressed during the various stages of government approvals, prior to pipeline construction.

Pipelines that traverse Minnesota are inevitably hundreds of miles long and, during construction, disturb thousands of acres of habitat, private and state-owned lands; with the potential to cross hundreds of

bodies of water, including ecologically valuable wetlands and streams. Development of infrastructure to support the extraction, refinement, and combustion of oil also has the potential to release additional carbon into the atmosphere and may perpetuate a carbon-based economic structure that contributes to climate change. [1] Consequently, the scope of the environmental and human health impacts that may result from the construction, operation and non-normal operation (including oil spills or pipeline ruptures) of crude oil pipelines is potentially significant.

Pipeline review process

This Report discusses procedures for approval of any proposed, new, or expanding pipeline project. A proposed pipeline project in Minnesota typically requires two approvals from the Minnesota Public Utilities Commission (Commission):

- A Certificate of Need
- A route permit

The Certificate of Need process, administered by the Commission, is designed to evaluate the need for a large energy project in Minnesota, specifically, whether the size, type, and timing of the proposal will meet an identified need consistent with various Minnesota policies, including reliability, reasonable utility costs, and environmental protection.[2] In its role as public advocate in these proceedings, the Division of Energy Resources of the Minnesota Department of Commerce evaluates all pipeline projects requiring a Certificate of Need, according to all applicable Minnesota statutes and rules.

Applicants proposing a crude oil pipeline project are also required to submit a route permit application to the Commission. The route permitting process is designed to determine the most appropriate route for a crude oil pipeline project and appropriate conditions on the construction of the project, consistent with various Minnesota policies; including minimizing potential human health and environmental impacts.[3] The route permitting process includes environmental review, through the preparation of a comparative environmental analysis (CEA), and a contested case hearing process. Beyond the Commission's route permit, the project proposer must also obtain other applicable state and federal permits.

Spill prevention, preparedness, emergency response, and safety

This Report discusses existing prevention, preparedness and emergency response laws, regulations and policies governing transportation of crude oil through pipeline.

A spill is the unintended loss of oil from the pipeline system and a rupture is a sudden and catastrophic loss and leak. The hazards, damage, and cleanup of each pipeline spill, leak, or rupture depends entirely on incident-specific factors such as the type of oil, quantity, the location of the spill, area topography, soils, hydrology, adjacent and downstream land type and use, weather, luck, and response by the spiller. Prevention is one measure to minimize the impacts potential of either a spill or a rupture. Pipeline operators are regulated by the Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Minnesota Office of Pipeline Safety (MNOPS). PHMSA requires that pipeline operators have a spill

[1] The White House; U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation (November 2014); retrieved on November 17, 2014 from www.whitehouse.gov/the-press-office/2014/11/11/fact-sheet-us-china-joint-announcement-climate-change-and-clean-energy-c
[2] Minn. R. 7853.0130
[3] Minn. R. 7852.1900

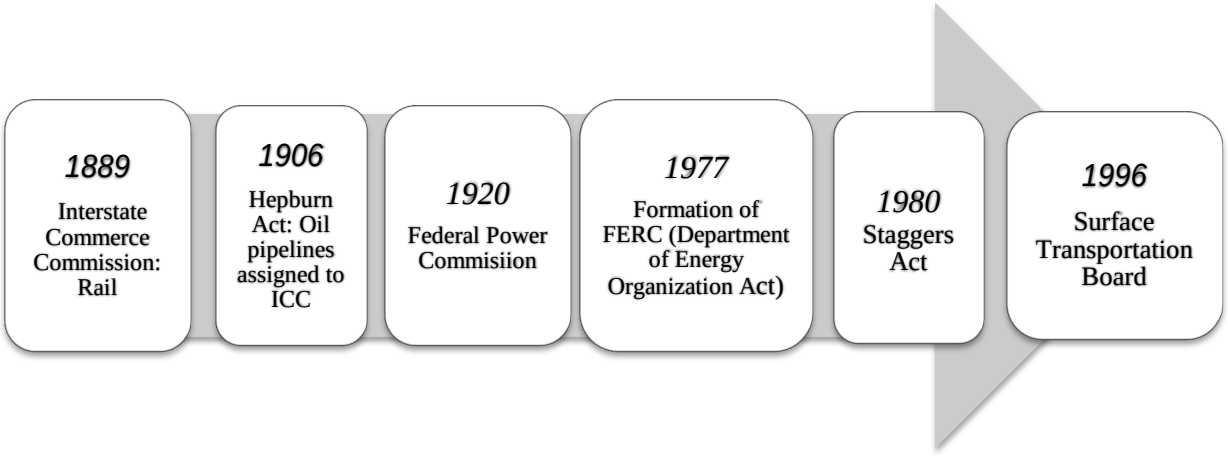
response plan that identifies response timeframes and resources. Federal regulations promulgated under the Oil Pollution Act[4] of 1990 require extensive oil spill response planning and preparedness for some types of facilities and very little for other facilities like railroads and pipelines.

The U.S. Coast Guard[5] and the U.S. Environmental Protection Agency (EPA)[6] regulations for ships, barges, refineries, and many large storage tanks have detailed requirements for equipment, staffing, training, organization, and other aspects of preparedness for large spills. The regulations also identify the amount of response equipment and staffing, and the timelines by which the equipment must be deployed and operating.

[4] U.S.C. Title 33, Chapter 40
[5] CFR Title 33, Parts 154 and 155
[6] CFR Title 40, Part 112

Background

Historical background on federal regulatory authority for oil.



Historical background of federal and state regulatory authority for oil transportation

Liquid petroleum transportation, including the movement of crude oil from production fields to refineries for processing and consumption is regulated by federal and state agencies. Currently, the:

- Surface Transportation Board (STB) exercises broad federal authority over railroad transportation and a portion of commercial truck transportation.
- Federal Energy Regulatory Commission (FERC**)** exercises a lesser degree of control over liquid pipelines through the setting of rates and terms of service.

States exercise control over liquid pipelines through permitting, routing and other approvals.

This regulation has its genesis with the federal Interstate Commerce Act of 1889, creating the Interstate Commerce Commission (ICC) to control monopolistic market and price controls practiced by colluding railroads, then the only viable form of long-distance, cross-country transportation for industry and the public in the United States (U.S.).

This power to regulate was authorized under the Commerce Clause of the U.S. Constitution and ultimately upheld by a series of Supreme Court and congressional actions, becoming established law until the Staggers Deregulation Act of 1980. Railroads were deemed to be “common carriers”, required to handle all goods tendered by the public for transportation in an impartial and consistently priced and served manner. As commercial trucking became a significant transportation mode during the early part of the 20th century, those truckers engaged in common carrier or public service was also brought under extensive control by the ICC. Monopolistic practices by the major oil companies also led to oil pipelines being assigned to ICC regulation under the Hepburn Act of 1906.

The ICC developed a very involved and rigorous process to regulate common carriers, particularly the railroads and common carrier trucking that involved an adversarial relationship between common carriers and shippers. Rates, services, routes, construction, abandonments, and mergers were determined by a public complaint resolution process. Oil pipelines faced a much less active regulatory process because there were few complaints to resolve as shippers of oil in the common carrier pipelines were all oil companies that also were joint owners of most of the pipelines. The inaction of the ICC and the relatively

low priority given to pipeline activity resulted in the federal government defaulting control by state governments over determination of need, siting, and construction of oil pipelines. During the mid and late twentieth century, there were relatively few pipeline projects undertaken (major exceptions being the development of the Explorer Petroleum Products Pipeline from the Gulf Coast to the Northeast, in response to wartime supply threats from enemy submarine against coast tankers, and the Alberta, Canada crude oil pipelines to the Midwest with the development of conventional heavy crude oil fields in the Province of Alberta in the 1950's).

The Staggers Act of 1980 signaled a fundamental shift towards deregulation of transportation common carriers. Railroads, truckers, airlines, and other modes all were impacted by relaxation or removal of historic restrictions. In 1996, Congress reinstituted limited common carrier regulation of railroads and common carrier trucking with the creation of the STB, both in response to shipper complaints and to strengthen interstate commerce regulation of the carriers. Local, city, and state challenges and attempts to weaken eminent domain powers and replace lax federal regulation were seen by Congress as beginning to impede interstate transportation activity, particularly in the Northeast.

Common carrier oil pipeline regulation took a somewhat different course. After the oil crisis created by the Organization of the Petroleum Exporting Countries (OPEC) oil embargo in 1973, there was a desire in Congress to initiate price and supply controls on the oil industry. This effort included moving oil pipelines away from the ineffective control of the ICC to the oversight of the FERC, an independent commission formed within the Department of Energy. The visibility of crude oil pipeline projects also began to change at this same time, with the environmentally challenging construction of the Alaska Pipeline from the large oil fields that had been discovered on Alaska's North Slope. However, the legacy of only partial regulatory control of the ICC on oil pipelines continued. States retain control of determining need, eminent domain, permitting, siting, and environmental review related to oil pipelines.

Minnesota in national and international petroleum transportation

From the 1830's, St. Paul was the head of navigation and the jumping off point for traders, lumbermen, and settlers. Minneapolis became the receiver of goods from the plains and the upper rivers, destined to become a milling town due to its abundance of water power. Starting in the 1870's, railroads connected the Twin Cities to Chicago, and then a number of Minnesota-based railroads reached to the West Coast. With four active river ports and more ports on the Great Lakes, the state hosted a huge volume of throughput serving the rest of the nation, and as a consequence developed a wide range of industry to transfer, store, process, and resell this stream of material.

Oil transport arose as a more recent phenomenon. Discoveries of natural gas in the Williston basin (eastern Montana, western North Dakota, South Dakota, and southern Saskatchewan) and further west in the Rockies led to a network of gas transmission lines reaching into and through the state. The strong economy of the upper Midwest led to a major common carrier pipeline installed to carry product from Oklahoma in the 1930's and 1940's, and the establishment of several refineries. By the 1960's, Canadian crude became a significant feedstock as pipelines reached these plants from the north. Growing Canadian supplies, first conventional crude oil and then tar sands heavy crude, led to additional pipeline capacity crossing the state, connecting to Chicago and points east and south.

Beginning in 2005, new drilling technology in the form of directional drilling and hydraulic fracturing allowed the development of new shale oil and gas fields across the U.S. The premier crude oil producing field among these was the Bakken shale deposits in North Dakota, Montana, and Saskatchewan. These deposits produced light, sweet crude oil, which was attractive to East Coast refineries with limited capacity and technology to refine heavy, sour crude oils. The high price of oil on the world market through 2014 created financial incentive to exploit this new resource as fast as possible. Because no crude oil pipeline network existed between North Dakota and the East Coast, railroads by default became major carriers of crude oil as the field production mushroomed.

From one train a day and a few thousand barrels of crude oil by rail in 2009, railroad traffic quickly grew to 11 trains per day by 2014, carrying 600,000 barrels of the field's one million barrel per day production. Up to 8 of those trains travel through Minnesota daily, as many as 7 of them through the Twin Cities. This amount represents 20% of the 3 million barrels of oil being carried through the state, with the rest via the northern pipelines.

Negative impacts of this rapid growth in railroad traffic resulted from the straining of all mainline rail capacity through the state, producing slowdowns of delivery in all types of rail shipments, from West Coast import containers, to coal for local power plants, and grain for export. Passenger train service on Amtrak slowed to a crawl. Peaks in traffic levels for all commodities combined with the extreme weather conditions of winter 2013-2014 slowed all rail traffic. The slow and heavy traffic also began congesting a large number of rail communities, threatening their ability to respond to emergencies and access town businesses.

These circumstances changed quickly as world economic conditions changed. A world oil glut developed as high prices brought more crude oil to market, relative to demand; eventually leading to a market correction as fuel prices began a steep decline; down 40% from their 2013 highs of $4.00 per gallon. The two major oil refineries operated by Koch and Marathon in the Twin Cities, which produce 400,000 barrels of product a day; half of the state of Minnesota's consumption, were utilizing only a small fraction of Bakken oil into 2014. As world economic conditions continue to change over time, production of oil is also expected to change over time.

As noted by the North Dakota Department of Mineral Resources, the Bakken now has proven reserves that make it the third largest oil field in the U.S. in history, and should have a productive life of at least 50 or more years.

Economic, technical, and environmental differences between modes of crude oil transport

The first successful pipelines were established in Pennsylvania and Ohio under the auspices of John D. Rockefeller, creator of the Standard Oil monopoly. The first commercial line was laid to undercut the cost of expensive draymen who were hauling crude from wellhead to railhead by wagon. The model was expanded for a larger, longer pipeline when Mr. Rockefeller found he could also beat the costs the railroads were charging from the railhead to his refinery. As the petroleum industry expanded in the face of universal consumption of kerosene and gasoline for light and vehicle power, oil company-controlled pipelines became the mode of choice.

After the oil trusts were broken by legislative and legal actions, the courts and government regulators allowed these oil pipelines to continue both as private carriers and as common carriers. Trucks and railroads were relegated to short or unserved line hauls of relatively small volumes. These hauls included truck collection of crude from small, dispersed wells, and rail transport of asphalt or natural gas to remote locations. Exceptions happened during World War II when tankers supplying the East Coast were under attack, and as the shale oil boom hit across huge land areas with un-concentrated sources of oil.

Oil refining and marketing

Different characteristics require different refining methods for crude oil types. To refine heavy crude oil, a refinery must have cracking or coking capacity in addition to basic refining equipment.

These processes, involving heat and chemicals, are used by refiners to further refine heavy, less valuable, petroleum products. Since heavy crude oils generally produce higher percentages of these products, additional processing is required to make refining of heavy crude oils profitable.

Because heavy crude oil requires additional treatment to produce valuable petroleum products such as gasoline, it trades separately and at a discount to lighter crudes that require only basic refinery processing.

As a rule of thumb, current economics favor oil transport via pipeline over single railcar loads of oil by a factor of almost two to one in cost per barrel of crude oil. Truck transport can be as much as three or more times as expensive as pipeline transport. The railroads in their current unregulated environment have utilized the concept of dedicated unit trains of tank cars to lower their costs to the oil companies. A unit train, consisting of approximately 110 cars carrying 30,000 gallons apiece, will load at one spot, travel non-stop to the destination, unload, and return empty for another load without ever breaking up the string of cars. This allows a higher average speed of transit, a tripling in car utilization, and better use of rail capacity.

The resulting savings allow the railroads to drop contract rates by as much as 30 percent below single carload tariffs. In the Bakken, this means a pipeline can transport oil 1,200 miles for about $10 per barrel, while the unit train will cost about $15 per barrel. The basic advantage of rail for this premium is that their capacity is readily available and can be increased in short order, the trains can be routed anywhere in the country as needed due to contract or market changes, and the capital cost to start up rail is a small fraction of the cost of a pipeline. In October, 2015, market price for Baaken light crude oils was approximately $42 per barrel and wellhead costs were $28 per barrel or less for half of the new Bakken

wells being drilled. With this price differential rail is still a viable economic as well as an operational option for oil producers.

Pipelines, whether common carrier or private, need a long term source of the petroleum, a long term customer, and a financial commitment or subscription to keep the pipeline full for an extended number of years. New pipeline construction may require 5 to 20 year subscriptions for a major part of their capacity before construction will be undertaken by the pipeline company. In the case of the Bakken and Canadian heavy crude oils, not only does a long term commitment exist, but the oil volumes are already moving by alternate modes in sufficient quantities.

Spills are always a major concern with oil transportation. Compared to a pipeline, rail transport is labor intensive and mechanically complex, with a higher potential for human error. Highway crossings in particular add an extra level of risk for rail accidents, as does the presence of pedestrians and residents near the tracks. Spills by pipelines are also a concern when spills are not quickly identified and addressed. Both modes of transport require the presence of emergency responders, sufficient equipment and materials to contain the spill, and high levels of training and coordination among all parties.

In Minnesota, the nature of the spill contamination and the potential for environmental damage is significantly different between the modes. While the majority of the pipelines tend to cross environmentally sensitive northern Minnesota wetlands and bogs, the railroads pass through a high number of settled and urbanized areas. Further, a high percentage of the railroad mileage is along the banks of the Mississippi River system, following an operationally logical water level route near both banks of the river. This poses a dual risk to populations and flowing waterways that may be greater for rail transport.

Location of oil formations

The majority of all crude oil moving to or through Minnesota comes from two areas. The first is the Bakken oil shale fields in North Dakota, Montana, and Saskatchewan. The second is the oil sands development primarily in the Athabasca oil sands of Alberta, Canada.

Approximately 900,000 barrels a day of Bakken oil moved through Minnesota in the fall of 2014 with a third by pipeline and two-thirds by rail. At the same time, 2.4 million barrels per day of Canadian crude moved through Minnesota, almost all by pipeline. Minnesota has two petroleum refineries for a combined production capacity of about 400,000 barrels per day. These refineries produce more than two-thirds of the state's petroleum products. The refineries use about 15% of the crude oil coming into the state with the bulk of the products refined from Canadian crude oil, supplemented by supplies from North Dakota's Bakken field.[7] Nearly all of the heavy crude oil refineries in the Upper Midwest receive a portion of their crude oil, either directly or indirectly, from pipeline systems that traverse Minnesota.

[7]Minnesota's Petroleum Infrastructure: Pipelines, Refineries, Terminals. Information Brief. Research Development, Minnesota House of Representatives. June 2013. http://www.house.leg.state.mn.us/hrd/pubs/petinfra.pdf

Crude oil characteristics

- **Mixture –** Crude oil is a natural mix of numerous hydrocarbon compounds that exists as a liquid at normal temperatures and pressures. The component compounds in the mixture range from light, simple molecules that may exist in a gaseous or semi-gaseous state to complex long-chain hydrocarbons that are relatively heavy and exist at the border between liquids and solids at normal temperatures. The crude mixture does not have the manufactured and consistent specifications of a refined product, such as diesel fuel or ethanol.
- **Flammability** – Flammability can be measured in three ways:
  - Flash point is when a material begins burning in the presence of a momentary ignition source, and its ability to keep burning.
  - Vapor pressure signifies how actively it evaporates under normal conditions into a gaseous state that readily supports burning.
  - Boiling point is the temperature at which the liquid bubbles and rapid vaporization occurs, thus supporting increased flames. Flammable materials require special handling and marking during transport.
- **Volatility –** The volatility of a flammable substance depends on ignition temperature and how fast the flame spreads.as it vaporizes. For crude oil, light compounds that may be semi-gaseous easily vaporize. Light crudes may also have significant amounts of dissolved gaseous compounds such as methanes, ethanes, and propanes. In contrast, heavy crudes have a high percentage of heavy hydrocarbon compounds with high boiling points. In some cases, the crude is combustible but not flammable under ordinary conditions, like asphalts. [8]
- **Diluted crudes, diluents –** Some crudes derived from oil sands can be heavier than water, with a thickness bordering on a semi-solid state. At normal temperatures and pressures, it may not be profitable or it may be physically impractical to pump. These characteristics have limited the approaches to transporting this material.

Currently, the most common method for making oil sands crude transportable is to dilute the heavy crude with a light petroleum material. This diluted mixture (sometimes referred to as dilbit for diluted bitumen), essentially a reconstituted medium crude oil, is lighter and offers better flow. As long as a steady volume of semi-refined diluent can be provided, a simple mixing operation will produce the diluted crude. This crude is then easily handled in pipeline or tank car at normal temperatures and pressures, in a liquid state.

In a spill, the specific gravity will cause the oil to float. Over time, the presence of a large percentage of heavy compounds in the mix may lead to separation as the oil emulsifies in water. Prompt cleanup response is essential in this case as it is with all crude oils. [9]

Bakken shale oil

The Bakken shale oil field has become a major source of high quality, sweet, light crude oil from North Dakota, Montana, and Saskatchewan. Prior to 2000, this source was considered unrecoverable, with the petroleum essentially trapped in impervious rock. The paired technologies of accurate horizontal drilling and extreme-pressure hydraulic fracturing of the shale formations allowed economically feasible recovery

[8]Light Ends Composition in Dilbit and Conventional Crudes. March 25, 2014. Alberta Innovates-Energy and Environment Solutions

[9] Properties of Dilbit and Conventional Crudes. February, 2014. Alberta Innovates-Technology Futures

rates for the first time. The U.S. Geological Survey (USGS) now estimates recoverable reserves of approximately 7.4 billion barrels. [10] This level ranks the Bakken roughly even with the Midland, Texas, oil formations and about half the size of Prudhoe Bay, Alaska, the two largest recorded oil fields in the U.S.

Figure 1: Shale play sand basins in the contiguous United States[11]

The Bakken formation consists of at least five producing levels continuously covering a large part of the Williston Basin in North Dakota, Montana, and Saskatchewan. The five levels are the Upper Bakken shale, the middle Bakken, the Lower Bakken shale, and the Upper and Lower Three Forks, in descending order. By fall 2014, 10,000 wells had been drilled and one billion barrels of oil produced. Ultimate development plans suggest a total of 45,000 to 60,000 drilled wells. High-speed drilling rigs are used to complete about 11 wells per day. Industry estimates in 2014 suggested a peak field production of 1.6 to 2.2 million barrels per day by 2023. [12] With the precipitous drop in crude oil prices in late 2014, plans have been announced to delay well drilling and well finishing. This would not impact production in the short term, but may move the date expected for peak field production into the future and could result in a decrease in production if the rig count falls below 130.

The Bakken shale formation represents the country's largest formation of tight oil, [13] oil trapped in relatively impervious rock at significant depths. As previously mentioned the formation consists of five stacked producing layers of continuous source material or horizontal collecting zones. The technology of precise

[10] U.S. Geological Survey Bakken-Three Forks Assessment Team, 2013, Input-form data for the U.S. Geological Survey assessment of the Devonian and Mississippian Bakken and Devonian Three Forks Formations of the U.S. Williston Basin Province, 2013: U.S. Geological Survey Open-File Report 2013–1094, 70 p., http://pubs.usgs.gov/of/2013/1094/.

[11] Shale play sand basins in the contiguous United States. 2011. Energy Information Administration

[12] Bakken Oil Business Journal, 'Annual Energy Outlook', August-September 2013, 'Optimizing Production for Success', June-July 2014

[13] The term tight oil does not have a specific technical, scientific, or geologic definition. Tight oil is an industry convention that generally refers to oil produced from very low permeability shale, sandstone, and carbonate formations, with permeability being a laboratory measure of the ability of a fluid to flow through the rock. In limited areas of some very low permeability formations, small volumes of oil have been produced for many decades. U.S. tight oil production: Alternative supply projections and an overview of EIA's analysis of well-level data aggregated to the county level. April 2014. http://www.eia.gov/forecasts/aeo/tight_oil.cfm

horizontal drilling allows wells to be drilled parallel to the surface and along each stratum to a distance of up to two miles from each vertical well bore which reaches from the surface to about 10,000 feet down.

After completing horizontal drilling, the well casing is perforated to allow large volume, high pressure hydraulic fracturing of the surrounding rock. The hydraulic fracturing employs large volumes of water and some chemical additives that assist flow to open cracks a hundred feet or more beyond the well.

Critical to this operation is the use of a proppant such as sand to prop open the cracks and allow space for the oil to flow. This proppant is carried as slurry in water used in the fracturing. Natural sand with the unique characteristics needed for proppant is known as frac sand, and is found in large deposits in Illinois, Wisconsin, and Minnesota.

Bakken crude is listed as light, sweet crude, meaning it has a high specific gravity and is low in sulfur and heavy metals content. Unlike the majority of shale production in the U.S., the Bakken field produces about 85% liquid petroleum and a small percentage of natural gas. While ethane, propane, and butane are all an active part of the crude's volatility, the general characteristics resemble any light sweet crude. Vapor pressure and boiling point are consistent with the normal specifications for moving liquids in general purpose non-pressurized railroad tank cars. The flash point, specific gravity, and initial boiling points are similar to refinery condensate, comparable to a mix of gasoline and kerosene. [14]

Canadian heavy crude oil

Alberta heavy sour crude oil now makes up the majority of U.S. imports; with 2.4 million barrels per day traveling through, or being consumed in, Minnesota. The majority of this oil is being transported by pipeline. While Alberta has a significant conventional oil industry, most of the heavy crude comes from oil sands mining and processing. The oil sands in Alberta represent the second largest recoverable deposit of heavy oil in the world, second only to Venezuela. The most easily mined deposits are surface beds of sand impregnated with asphaltic tar; that contains about 90% oil by weight.

The tar can be separated from the sand by a number of mechanical measures, including water washes, solvent flushing, and heating. The resulting separated tar is heavy. It also contains high sulfur content, 2.5 to 4.5% by weight, as well as heavy metals, consistent with heavy sour crude.

Its high viscosity, or thickness, makes it difficult to handle as a liquid unless heated. After it is exposed to the atmosphere, the tar often is reduced from a flammable condition to a combustible material. This

Oil sands vs. tar sands

The terms "oil sands" and "tar sands" are used interchangeably to describe a type of nonconventional oil resource that is found throughout the world. The U.S. Geological Survey calls tar sands a "generic term that has been used for several decades to describe petroleum-bearing rock exposed on the Earth's surface (USGS, Natural Bitumen Resources of the United States, 2006)." The natural bitumen in the oil sands is black and sticky like "tar". Nevertheless, many government resources refer to the deposits as tar sand, oil sands, or both.

Oil Sands and the Keystone XL Pipeline: Background and Selected Environmental Issues. Congressional Research Service, February 2013.

[14] A Survey of Bakken Crude Oil Characteristics Assembled for the U.S. Department of Transportation. May 14, 2014. American Fuel & Petrochemical Manufacturers as requested by Pipeline and Hazardous Material Safety Administration

heavy crude can be processed into less viscous oil. This process prepares the oil for transport by pipeline or rail, and pre-conditions it for refining.

A less costly alternative is to dilute the heavy crude with a lighter petroleum crude or product. In the case of Alberta heavy oil production, the solution has been to transport light petroleum products into the area to use as a diluent. The resulting diluted bitumen (dilbit) has the necessary lower viscosity to be easily pumped at normal temperatures. [15]

Hazardous material categories

Bakken crude oil is considered highly flammable and volatile. The Pipeline and Hazardous Material Safety Administration (PHMSA) requires it to be categorized and placarded as "Flammable 3, Packing Group 1" – the most dangerous level of flammable ranking.

Canadian oil sands crude is considered flammable, but less volatile particularly due to the removal during refining of ethane, propane, and butane. It is normally categorized and placarded as "Flammable 3, Packing Group 2," a less dangerous ranking.

Pipelines in Minnesota

Throughout Minnesota, there are 65,000 miles of pipeline moving natural gas, propane, anhydrous ammonia, crude oil, and refined petroleum products such as gasoline and diesel fuel.

Of the 65,000 miles of pipeline in Minnesota, nearly 5,000 miles of those miles are hazardous liquid pipelines. Pipelines carrying crude oil are a subset of the hazardous liquid pipelines and represent about half, 2,403 miles. However another 1,708 miles of hazardous pipelines carry refined products such as gasoline and diesel fuel. The remaining 825 miles of Minnesota hazardous liquid pipelines are used to transport highly volatile liquids such as propane and anhydrous ammonia.

Table 1 shows the miles of hazardous liquid pipelines in Minnesota as well as other infrastructure used for short term storage of the materials. This report will commonly refer to the approximately 4,100 miles of hazardous liquid pipelines carrying crude oil and refined products throughout the state.

Table 1: Hazardous liquid pipelines and breakout tanks in Minnesota[16]

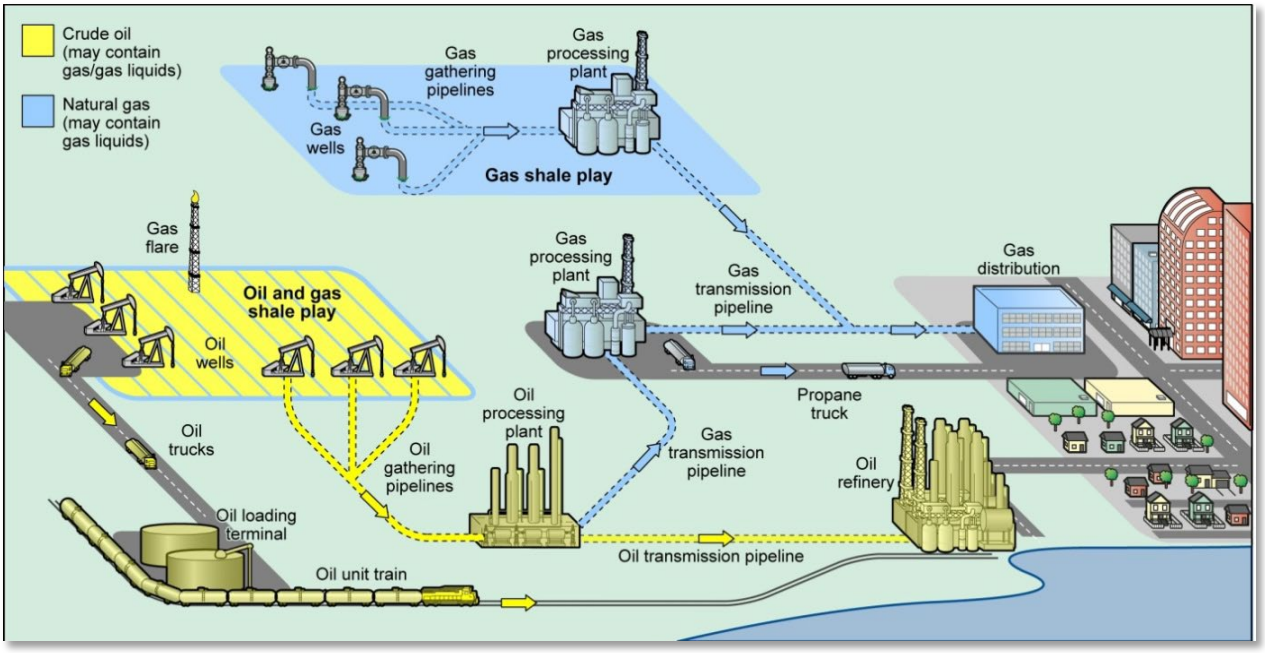
Commodity	Interstate miles	Intrastate miles	Total miles	Miles of gathering	Breakout tanks
Crude oil	2,403.2	4.7	2,407.9	0	32
Highly volatile liquids flammable / toxic	816.3	8.0	824.3	0	13
Refined petroleum products	1,708.8	12.9	1,721.7	0	88
Totals	4,928.3	25.6	4,953.9	0	133

[15]Basic recap by American Fuel & Petrochemical manufactures of a variety of refining and manufacturing methods for crude oil, specifications, handling, and other technical background information. Detailed technical papers available on site. www.afpm.org/industry101

[16] U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. October 2014, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages

Crude oil extracted from oil fields and the products made from the oil are transported via Minnesota pipelines from production wells or refineries. Pipelines moving materials from the well head are transported via "gathering" pipelines to processing plants. There are currently no production fields or gathering lines in Minnesota, rather the pipelines moving oil across the state are larger-diameter transmission pipelines. Figure 2 demonstrates the different types of pipes and the materials they transport.

Figure 2: Oil and natural gas transportation – production to end user[17]



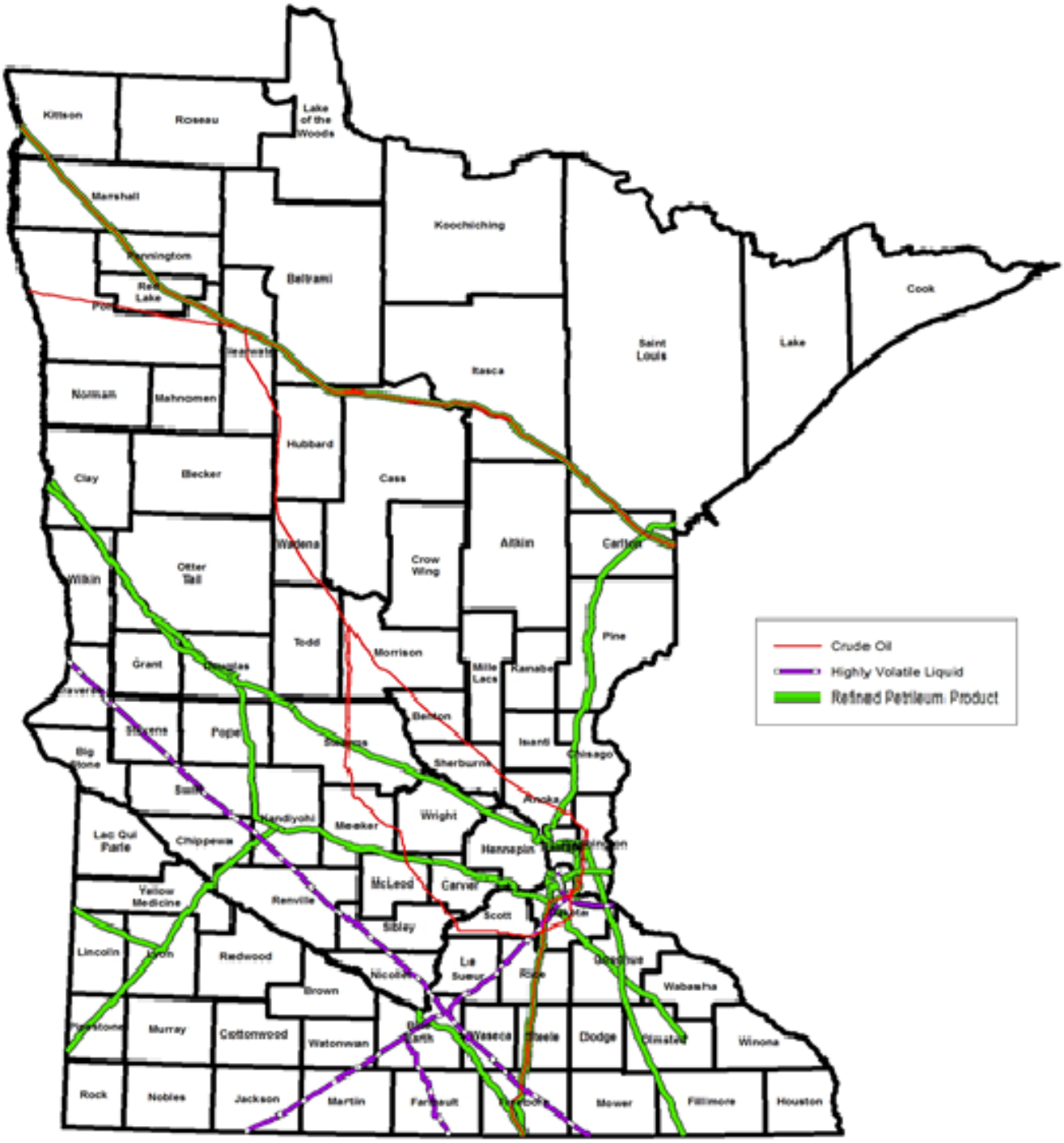
Crude oil is transported by larger-diameter transmission pipelines through Minnesota to either Minnesota refineries or refineries in other states. Minnesota has two refineries that refine crude oil into products such as gasoline and diesel fuel. Tank trucks or pipelines transport these products to their retail or storage destinations.

There are 133 "break-out" tanks included in Minnesota's hazardous liquid pipeline system. These tanks are used to relieve product surges in pipelines, and to store products for reinjection into the pipeline for transportation.

Hazardous liquid pipelines traverse the state carrying crude oil, flammable liquids and petroleum products. Figure 3 shows the approximate locations of the pipelines and the materials they carry.

[17] Oil and Gas Transportation. U.S. Government Accountability Office. August 2014, http://www.gao.gov/products/GAO-14-667

Figure 3: Minnesota hazardous liquid pipelines[18]



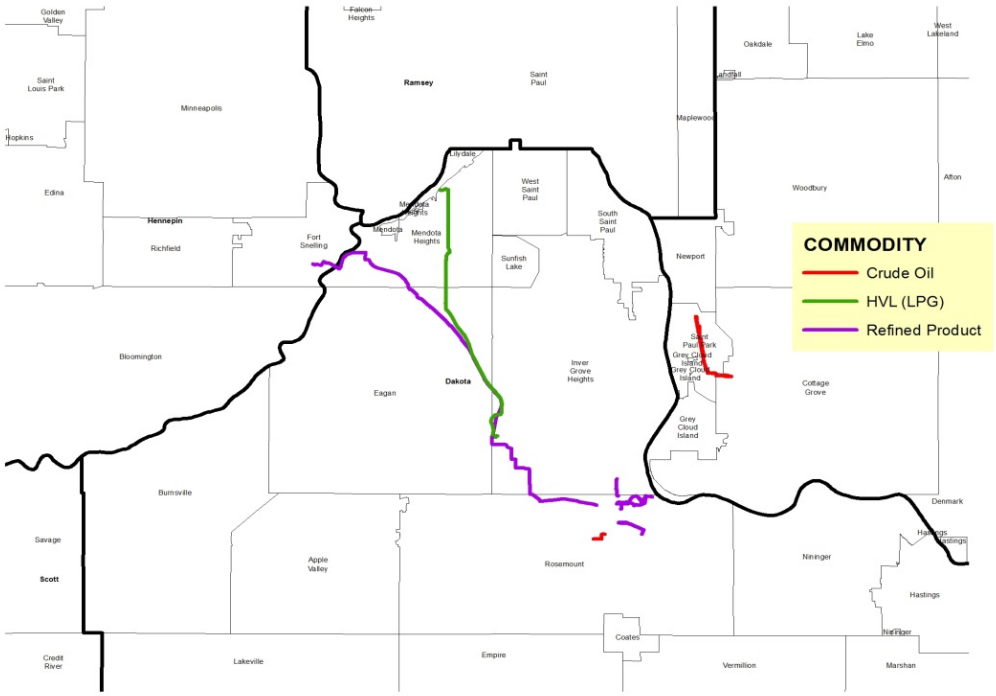
[18] Prepared by the Minnesota Office of Pipeline Safety, October 2014

Interstate and intrastate pipelines

Pipelines are categorized as *intrastate* or *interstate*.

- **Intrastate pipelines –** Pipelines that start and end within the state, such as those in Figure 4. Intrastate pipelines are typically jurisdictional to a state authority as permitted by law.
- **Interstate pipelines** – Pipelines that carry products across state lines. Interstate pipelines are jurisdictional to PHMSA, which is part of the Federal Department of Transportation.

Figure 4: Intrastate hazardous liquid pipelines in Minnesota

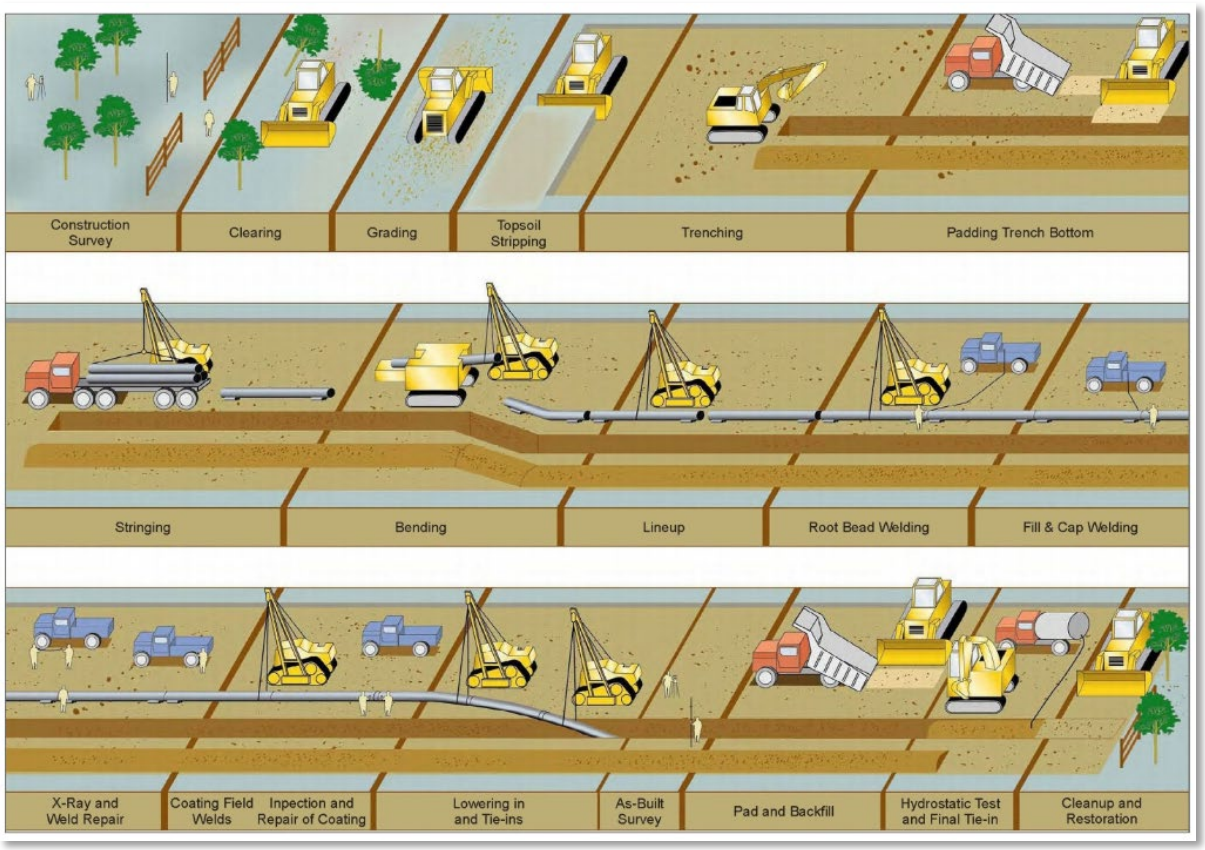


Pipeline construction

Pipeline construction begins with the preparation of the rights-of-way (ROW) as illustrated in Figure 5. To clear the ROW trees, boulders, brush, and other objects are removed. The area is then graded, or in agricultural areas, topsoil may be stripped to a predetermined depth and stockpiled along the sides of the ROW. To prevent erosion of disturbed soils silt fences are erected along edges of streams and wetlands. [19]

Wheel trenchers or backhoes are used to dig and rock drilling and blasting can be used where required to break rock to make the trench where the pipeline will be laid. [20] The material that is excavated during trenching is temporarily stockpiled on the non-working side of the trench, and is later used to backfill the operation.

Figure 5: Typical pipeline construction sequence[21]



[19] Pipeline Construction: Site Preparation, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#SitePrep Accessed: January 21, 2015.
[20] Pipeline Construction: Trenching, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#SitePrep Accessed January 21, 2015.
[21] Executive Summary. Final Environmental Impact Statement for the Proposed Keystone XL Project. August 26, 2011. United State Department of State Bureau of Oceans and International Environmental and Scientific Affairs. http://keystonepipeline-xl.state.gov/documents/organization/182010.pdf

Trenches are dug deep enough to allow for an adequate amount of cover when the pipe is buried. The depth of burial of the line must be in accordance with Federal pipeline safety regulations. [22] For instance, transmission pipelines are buried at least 30 inches below the surface in rural areas and deeper in more populated areas. [23] Pipelines that cross inland bodies of water must be buried at a depth of 48 inches. In agricultural areas, they must be buried below the level of cultivation. Burial depth requirements may change over time because farming and erosion and can increase risk of the pipeline being damaged during planting, tilling or drain tiling.

The pipe is strung in place and then a bending machine is used to make slight bends in individual sections of the pipe to account for changes in the pipeline route and to conform to the topography. [24] The pipe sections are then welded together into one continuous length. Special pipeline equipment called side booms are used to pick up, support and align each piece of pipe with the next piece to make the first pass of each weld.

After the pipe is welded, the welds are examined, usually by X-ray, and a coating is applied to the welded areas at the ends of the pipe sections to prevent corrosion. [25]Once the pipeline is welded and coated, it is lowered into the trench. Then the trench is carefully backfilled, to ensure that the pipe and its coating are not damaged. This is generally accomplished with either a backhoe or padding machine depending on the soil makeup. [26] The excavated material is returned to the trench in reverse order, with the subsoil put back first, followed by the topsoil.

All newly constructed hazardous liquid pipelines must be hydrostatically tested before they are used to transport materials. The purpose of a hydrostatic pressure test is to eliminate any defect that might threaten the pipeline's ability to sustain its maximum operating pressure, or to determine that no defects exist. [27] Finally, the construction right of way is restored as closely as possible to its original condition. In hilly areas, erosion-prevention measures such as interceptor dikes to divert water are installed. [28] Stone or timber materials are also sometimes installed along streams and wetlands to stabilize soils and retain habitat following construction.

More information on construction practices related to crossing water bodies is described in the Environment and Human Health Impacts section of this report.

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[22] Ibid.
[23] Ibid
[24]Pipeline Construction: Bending, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#Bending Accessed January 21, 2015.
[25] Ibid.
[26] Pipeline Construction: Lowering and Backfilling, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#Lowering Accessed January 21, 2015.
[27] Pipeline Construction: Testing, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#Lowering Accessed January 21, 2015.
[28] Pipeline Construction: Site Restoration, U.S. Department of Transportation. Pipeline and Hazardous Materials Safety Administration. http://primis.phmsa.dot.gov/Comm/construction/index.htm#Lowering Accessed January 21, 2015.

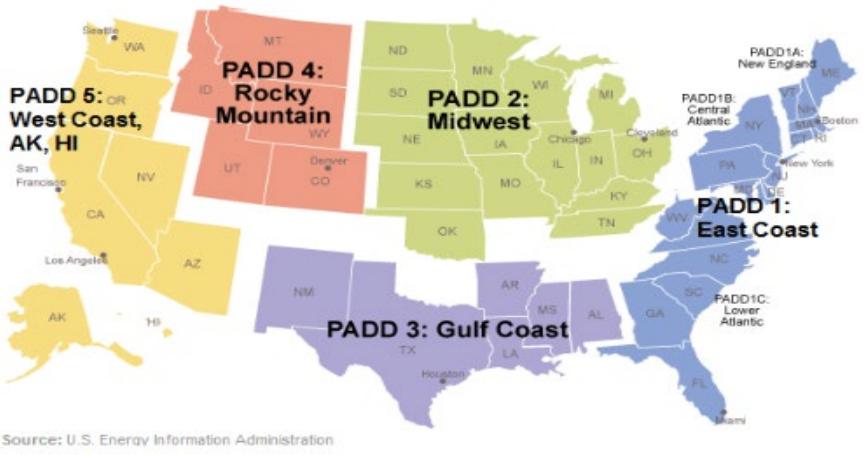
Economics of oil transportation

This section addresses the interconnectedness of crude oil transportation with other industries and commodities, while exploring the economic impacts as a result of the North American oil boom and construction of new pipelines in Minnesota.

Regional overview

Currently, the Midwest (Petroleum Administration for Defense District (PADD) 2) seen in Figure 6, receives more crude oil from other regions in the U.S. than it exports, but forecasts in mid-2014 projected that by 2020 PADD 2 would be a net exporter of liquid hydrocarbons for the first time in history.

Figure 6: Petroleum Administration for Defense Districts (PADDs)[29]



The increased oil production in North Dakota was driving this forecast. PADD 2 becoming a net exporter by 2020 assumes stable or increasing crude oil production from the Bakken region. However, rapidly declining global oil prices could undermine this assumption.

Market uncertainty

From June to December 2014, oversupplied markets and weakening demand caused global oil prices to plummet 40% to around $60 a barrel. [30] This decline continued in 2015, with prices generally below $50 per barrel as of November, 2015. Naturally, this fall raises questions about future North American shale production, which is often more expensive than conventional drilling.

Traditional oil reservoirs are made of porous rock that allows oil to flow relatively easily over a large area. As a result, yields from traditional wells decline slowly (around 6% per year). [31] Shale oil sits in less

[29] U.S. Department of Energy. Energy Information Administration. 2014
[30] Associated Press. Plunging Oil Prices Take Wall St. Lower. December 2014. *The New York Times.* Retrieved from: http://www.nytimes.com/2014/12/11/business/daily-stock-market-activity.html?_r=0
[31] The Economics of Shale Oil February 2014. *The Economist.* Retrieved from: http://www.economist.com/news/united-states/21596553-benefits-shale-oil-are-bigger-many-americans-realise-policy-has-yet-catch.

permeable rock formations that do not allow for the same flows. Thus, production declines more rapidly (30% per year) necessitating new wells. [32] The International Energy Association estimates that maintaining one million barrels per day in a conventional oil field, such as in southern Iraq requires 60 new wells a year. In Bakken, it requires 2,500 new wells a year.

These additional costs result in a higher breakeven price for Bakken crude. IHS Global Insight estimates most tight oil additions have a breakeven between $50 and $69 a barrel.[33] This average varies from region to region; data submitted to North Dakota's Department of Mineral Resources estimates breakeven points as low as $27 a barrel in North Dakota's Dunn and McKenzie counties.[34] While the exact breakeven is ambiguous, global oil prices of $70 a barrel will certainly mean less long term production than prices above $100.

On the other hand, many global forces affect Bakken's breakeven point. New technologies and processes, such as multi-well pad drilling, are lowering the price of shale production. Congress could also stimulate the U.S. crude market by lifting the export ban – allowing producers to sell at higher global prices. [35] Moreover, an improvement of global market conditions would increase prices.

In the short term, price fluctuations have little impact on production – large capital investments by oil firms take time to wind down. [36] In the long term, however, declining prices would lead to declining production. The effects of this dynamic system make it harder to determine the proper level of infrastructure investment for Minnesota.

Regional interdependencies of crude oil and petroleum product flows

In addition to crude oil, pipelines transport petroleum products within the region. Transporting refined products can be done relatively cheaply and easily resulting in a competitive petroleum market within the region. This has the potential to put Minnesota consumers at a disadvantage if refiners choose not to sell products in Minnesota where prices are low and instead, sell their products in markets with higher prices.[37]

Nevertheless, Minnesota is connected via direct-refined petroleum product pipelines to markets in the Gulf Coast, and indirectly to East Coast markets. This connection to the other regions pools risk and reduces price volatility in the state. More refined product pipelines will grow the pool, resulting in smaller price increases during supply disruptions. Construction of additional refined petroleum product pipelines would strengthen interregional market integration, increasing price correlations between the regions a new pipeline connects.

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[32] Ibid.
[33] Impact of Lower Oil Price. December 2014. *IHS Global Insights.* Presentation to MN DEED.
[34] Ritter, A. (personal communication, December 10, 2014). Data submitted by operators to the ND DMR.
[35] The Economics of Shale Oil (2014, February 14). *The Economist.* Retrieved from: http://www.economist.com/news/united-states/21596553-benefits-shale-oil-are-bigger-many-americans-realise-policy-has-yet-catch.
[36] Ibid.
[37] Refiners could divert petroleum product supplies from the Minnesota market to take advantage of higher prices in the Chicago market, thus decreasing supply available to Minnesotans. As a result, the market would adjust prices upward to keep supply and demand in balance. As a consequence of market interconnection, Minnesota has an interest in the adequacy of supply to other parts of PADD II with petroleum and petroleum pipeline connections to our area.

The construction of new crude oil pipelines would have more ambiguous effects. Refineries near the new pipelines would likely benefit from decreased crude oil costs, and regional refined product prices would decrease if refiners pass the savings on to consumers. However, a new pipeline would increase demand for crude oil sourced in the region where the line originates, increasing local refinery input prices, thereby increasing refined product prices there. This situation would increase petroleum product price convergence between the regions. The level of price convergence would depend on how much of the cost savings or increases refiners in both regions pass on to consumers.

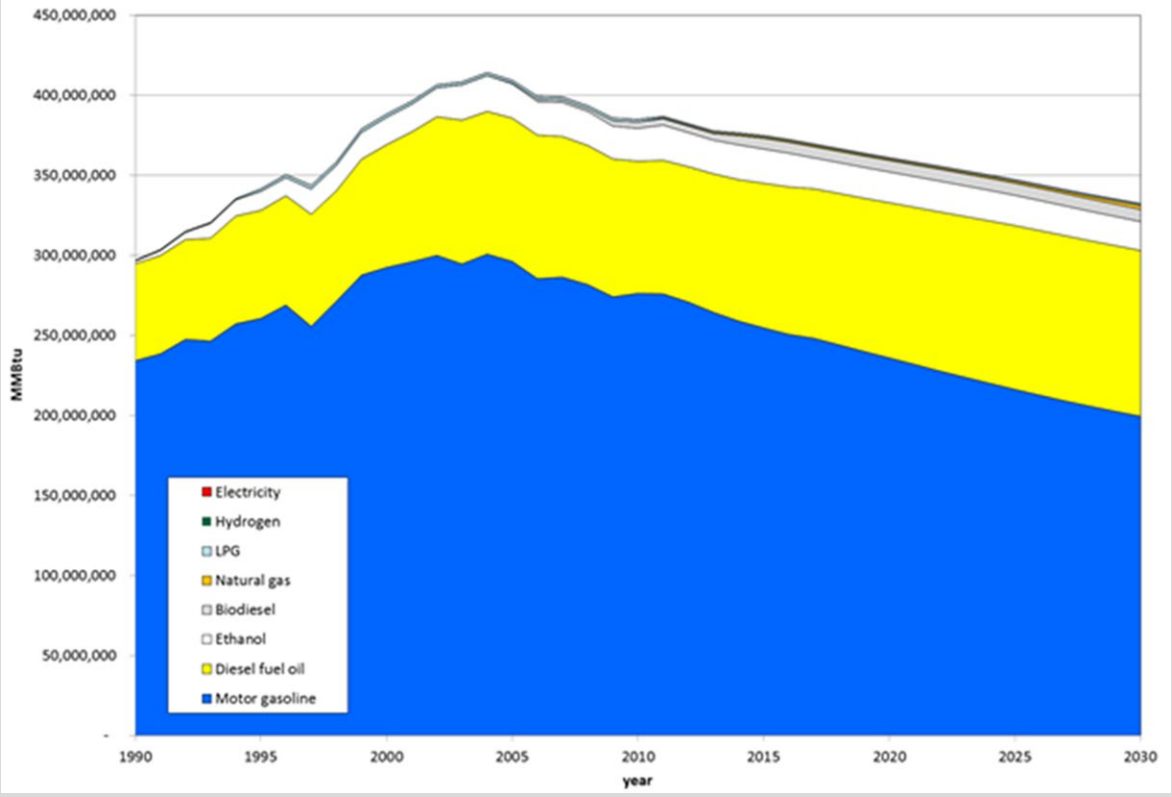
Petroleum product flows

Minnesota is a net importer of refined petroleum products, and ships petroleum products to other states in the region by way of several pipelines that cross through the state. There is a strong interdependence between Minnesota and other states in the region for refined petroleum, and specifically a high level of regional refined product market integration between the Midwest and Gulf Coast regions. The Midwest benefits from its connection to the Gulf Coast's refined petroleum product markets, which act as a price-setting mechanism and reduce market volatility in the event of product supply disruptions. This insulates Midwestern consumers from large, long-term swings in the prices of refined products, such as gasoline.

Figure 7: Historic and forecasted highway energy use

Minnesota petroleum product use

Between 2011 and 2030, Minnesota is projected to use 28% less gasoline, despite increases in vehicle miles traveled. This reduction is predominantly a function of increased efficiency standards, but also includes petroleum replacement options such as ethanol and biodiesel.



Information provided by the Minnesota Pollution Control Agency.

Current and future transportation of Bakken and Canadian crude oil

The boom in domestic crude oil production has created logistical challenges for the nation's transportation infrastructure. Crude oil transportation in Minnesota impacts pipelines, rail, trucks, and water. While pipelines are traditionally the primary means for producers to ship oil from inland sources, such as the Bakken, to refineries, rail has been known to take an increasing share of oil shipments. [38]

As of May 2014, Bakken crude production reached 1 million barrels per day, with an estimated 355,000 barrels per day shipped in pipelines. Of the up to 700,000 barrels per day moving by train (on nine trains per day) and any increase in Bakken production is expected to travel by rail – with 70% of that oil traveling through Minnesota.

In 2013, Canadian crude oil production was about 3.5 million barrels per day with expected growth of 6.4 million barrels per day by 2030. These supplies will primarily be used to meet stable or growing North American demand (40% of U.S. consumption is still from imports). Excess supply may be a candidate for export.

Transportation of crude oil by waterways and the Great Lakes

Currently, inland tank barges are not moving crude in Minnesota on the Mississippi River. However, Canadian crude oil is piped to Illinois where it is being loaded onto barges for shipment by way of the Mississippi River. [39] Crude oil is moved out of Canadian ports by ship on the St. Lawrence River to the Gulf of Mexico and Europe, though not yet on the Great Lakes. Recently, a petroleum refiner proposed construction of crude oil loading docks near its refinery in Superior, Wisconsin, but the permit was never issued. [40] Meanwhile, diluted tar from the Alberta oil sands began moving out of the port of Sorel-Tracy in Quebec in September 2014. [41]

The seasonality of waterway shipping and the potential for oil spills during inclement weather conditions complicate transport of crude oil on Minnesota's waterways. The shipping season on the Upper Mississippi River runs from about late March through the end of November. On the Great Lakes, shipping generally starts in late March and officially closes on January 15.

Current operations on the Great Lakes already include a wide variety of petroleum products, ranging from gasoline to asphalt. While few vessels trade in this product on Lake Superior, a number of Seaway-class tankers and barges handle significant volumes of light and heavy oils on the lower Great Lakes. Large operating terminals exist in a number of ports, including Green Bay, Milwaukee, and Chicago. There are currently proposals to move heavy crude oils on the lakes via existing, licensed terminals at Milwaukee, Wisconsin, and in new terminals in Thunder Bay, Ontario.

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[38] A 110-car unit train of railroad tank cars has the capacity to carry approximately 78,500 barrels or 3.3 million gallons of crude at a time. By moving a single unit from the oil field to a refinery, then returning empty cars and repeating the trip, track and car utilization can be optimized and deliver a complete turn of the unit train every 12 days. That is three to five times faster than single cars can be turned.

[39] Rock the Boat Don't Rock the Board – The Inland Crude Tank Barge Fleet. RBN Energy LLC. March 10, 2014. Retrieved from: https://rbnenergy.com/rock-the-boat-don-t-rock-the-boat-the-inland-crude-tank-barge-fleet

[40] DNR Delays Upgrade for Superior Dock. *Journal Sentinel*.January 9, 2014. Retrieved from: http://www.jsonline.com/news/wisconsin/dnr-delays-upgrade-for-superior-dock-b99180921z1-239517231.html

[41] First Oil Sands Bitumen Tanker Arrives in Sorel-Tracy Port. *CBC News*. September 22, 2014. Retrieved from: http://www.cbc.ca/news/canada/montreal/first-oil-sands-bitumen-tanker-arrives-in-sorel-tracy-port-1.2774225

Pipeline and rail comparisons

Pipelines are often considered the most efficient way to ship oil, but face rising competition from the more agile rail industry. Shipping oil by pipeline is significantly cheaper than rail – around $5 per barrel compared with $10 to 15 on rail. [42] Moreover, commodities shipped by pipeline, unlike other transit modes, are unaffected by weather or limited capacity during peak demand (such as harvest or retail holidays).

Historically, rail companies are able to compete by offering shorter contracts (1 to 2 years) than pipelines (10 to 15 years), which reduces risk for oil producers unsure of future prices, demand, or deposit longevity. [43] Moreover, rail transport is significantly faster than transport by pipeline. A trip from the Bakken to Gulf Coast refineries takes five to seven days by rail, compared to 40 days by pipeline. [44]

The feature most important to growth in oil by rail is its ability to pivot quickly to meet demand. With nearly 140,000 miles of railroad compared with 57,000 miles of pipeline, existing lines are more likely to be near oil production. [45] Railroads merely have to lay a few extra miles of track and build a terminal to connect remote wells to a nationwide rail network. [46] New pipelines, on the other hand, cost billions of dollars and take years of planning and construction.

For these reasons, it is not surprising that oil producers have been shipping ever-larger volumes by rail. Industry analysts project rail revenues will grow to $90.8 billion in 2017, representing a 5.1% annual growth rate from 2012. [47] A 2014 Congressional Research Service report notes, "U.S. freight railroads are estimated to have carried 434,000 carloads of crude oil in 2013, or roughly 300 million barrels, compared to 9,500 carloads in 2008." In July 2014, North Dakota producers in the Williston Basin transported 60% of their oil out of the state by rail and only 33% by pipeline. [48]

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[42] Frittelli, J., Parfomak, P. W., Ramseur, J. L., Andrews, A., Pirog, R., & Ratner, M. (2014, May 5). U.S. Rail Transportation of Crude Oil: Background and Issues for Congress. *Congressional Research Service.* Retrieved October 9, 2014 from http://fas.org/sgp/crs/misc/R43390.pdf

[43] Ibid.

[44] BB&T Capital Markets, Examining the Crude by Barge Opportunity, June 10, 2013, p. 15. As cited in U.S. Rail Transportation of Crude Oil: Background and Issues for Congress.

[45] Frittelli, J., Parfomak, P. W., Ramseur, J. L., Andrews, A., Pirog, R., & Ratner, M. (2014, May 5). U.S. Rail Transportation of Crude Oil: Background and Issues for Congress. *Congressional Research Service.* Retrieved from http://fas.org/sgp/crs/misc/R43390.pdf

[46] Philips, M. (2013, June 13). Amid U.S. Oil Boom, Railroads Are Beating Pipelines in Crude Transport. *Bloomberg.* Retrieved from: http://www.businessweek.com/articles/2013-06-13/amid-u-dot-s-dot-oil-boom-railroads-are-beating-pipelines-in-crude-transport

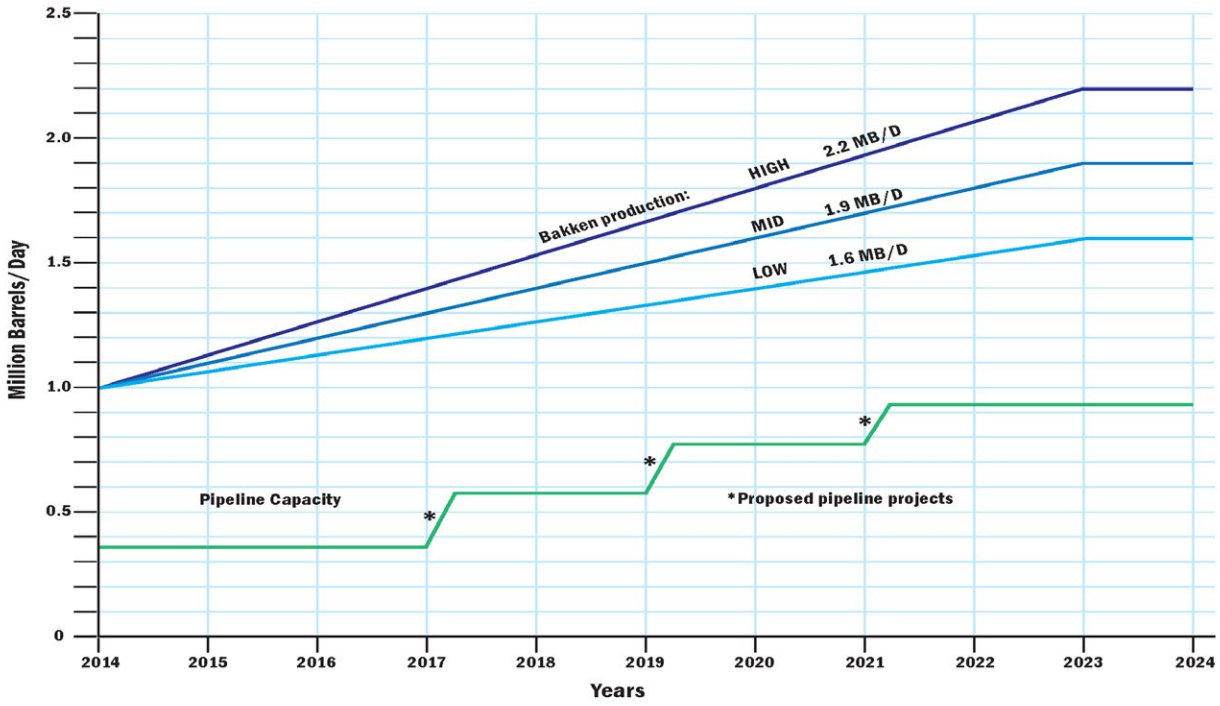
[47] Freight by Rail: United States. (April 2013). *Freedonia Focus Reports.*

[48] The remaining seven percent was trucked to Canadian pipelines or refined locally; North Dakota Pipeline Authority. (2014). Retrieved from https://ndpipelines.files.wordpress.com/2012/04/ndpa-monthly-update-september-12-2014.pdf.

Projected pipeline expansions

Figure 8 shows the projected low, middle, and high levels of Bakken growth in production with current and projected pipeline capacity increases.[49] Three proposed Minnesota pipeline expansions projects may be dedicated all or in part to transporting Bakken crude oil in the next decade for a total of 735,000 barrels per day.[50] Figure **9** 9 includes projections for Canadian crude oil production.

Figure 8: Bakken production projections and pipeline capacities[51]

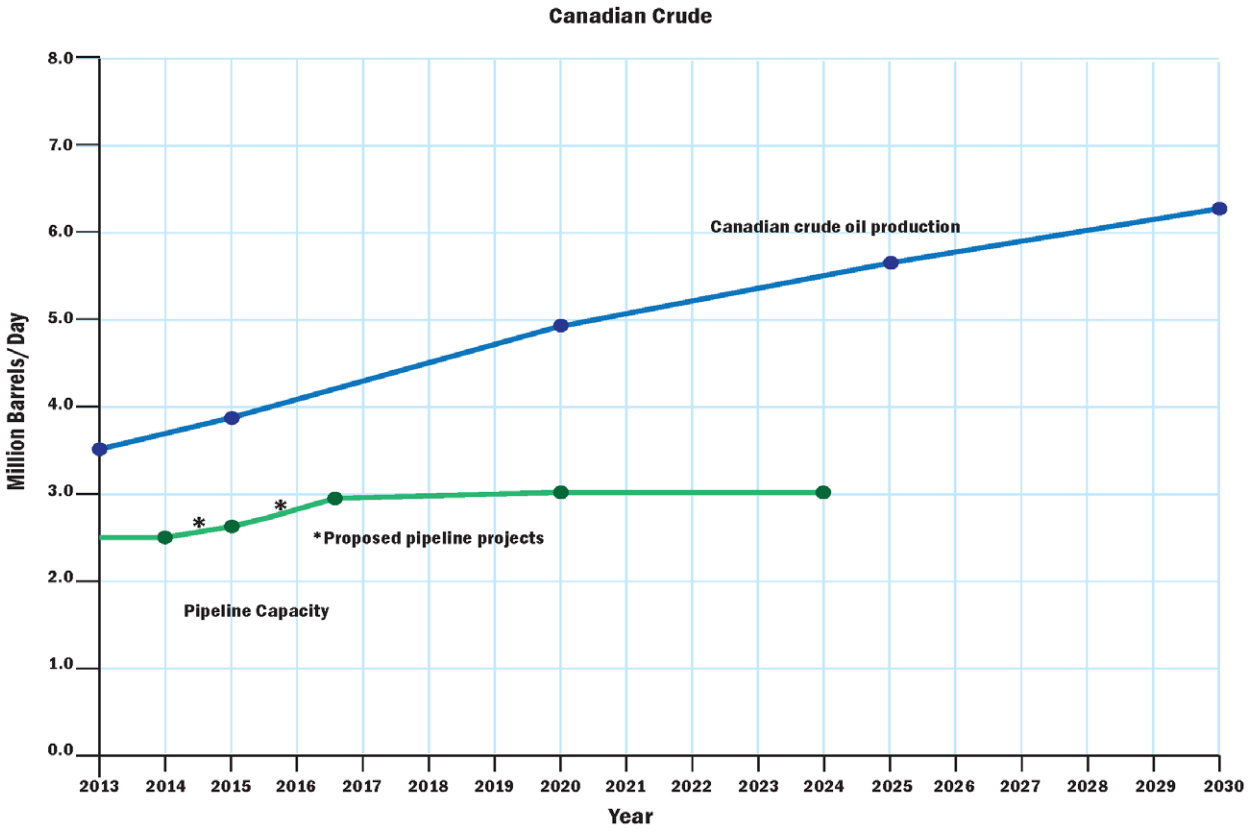


[49] For the purpose of the graph only, it is assumed that all three pipeline expansions through Minnesota would transport Bakken crude oil.

[50] This information assumes a largely uncontested permitting and environmental review process in each case. To the best of our knowledge, no other pipelines will come online during the next decade.

[51] Analysis by Minnesota Department of Commerce and Department of Transportation. 2014.

Figure 9: Canadian crude projections and pipeline capacities[52]



Assuming pipeline and railroads are directly substitutable would be a simplification. In many ways, they act like complements. Producers frequently transport oil by both modes on its way from well to refinery. As one BNSF vice president noted, "You might think of pipelines as our competitor, and they are, but they're also becoming our customers." [53]

It also may be true that any increase in pipeline and rail access in the Bakken region would allow the industry to increase oil output. In this case, increased pipeline access may not lead to decreased rail congestion, as increased production would still meet capacity for all transport options.

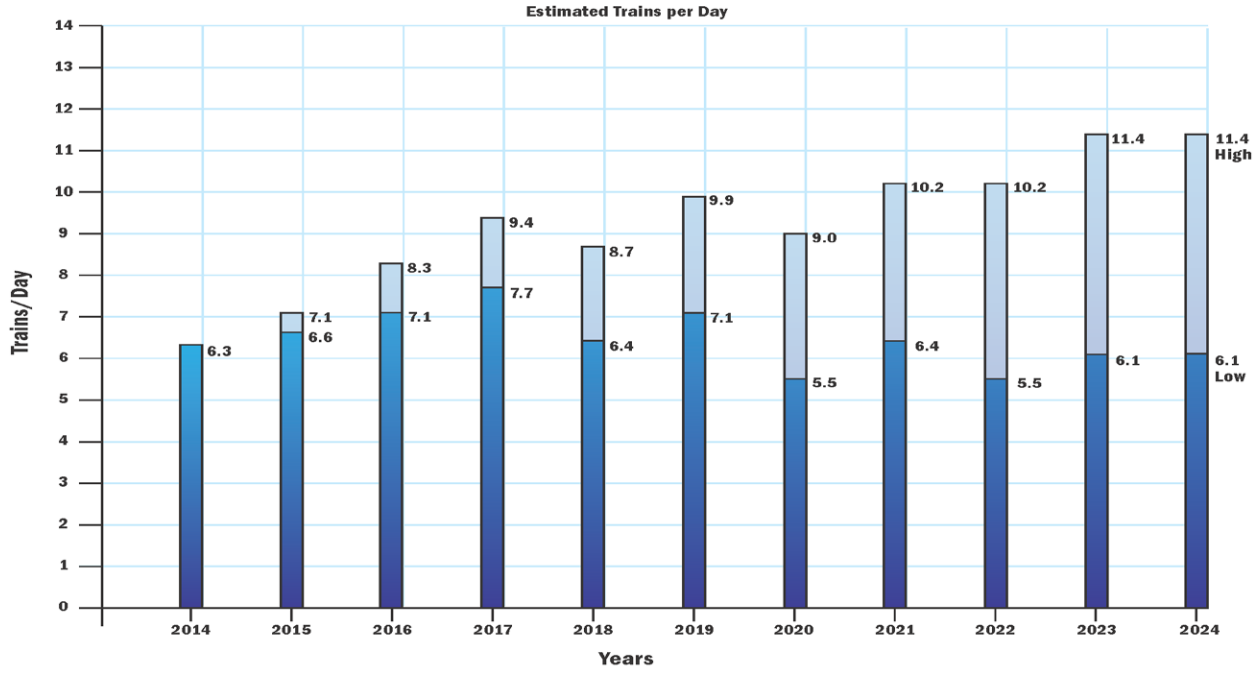
To that point, Figure 10 shows the potential range of crude oil trains traveling daily across Minnesota railroads. This estimate reflects the difference between the capacity of pipelines described above and the range of increasing Bakken crude oil production achieved. The number of trains assumes 70% of this difference will move east and south through Minnesota. A single unit train of crude oil with 110 tank cars is calculated to carry 3.3 million gallons or 78,500 barrels on each loaded trip.

[52] Analysis by Minnesota Department of Commerce and Department of Transportation. 2014.
[53] Philips, M. (2013, June 13). Amid U.S. Oil Boom, Railroads Are Beating Pipelines in Crude Transport. *Bloomberg*. Retrieved from: http://www.businessweek.com/articles/2013-06-13/amid-u-dot-s-dot-oil-boom-railroads-are-beating-pipelines-in-crude-transport

Figure 10: Estimated trains per day[54]

Dark blue portion of bar represents number of unit trains needed to meet the low Bakken production projection shown on Figure 8.

Light blue portion of bar represents number of unit trains needed to meet the high Bakken production projection shown on Figure 8.



Downstream economic impacts

In 2014, the increase in shipping of Bakken crude by rail and the resulting congestion hurt Minnesota's farming, mining, energy, retail, and manufacturing industries. [55] Increased prices and delays made it more difficult for producers to get inputs to maintain operations or send goods to market.

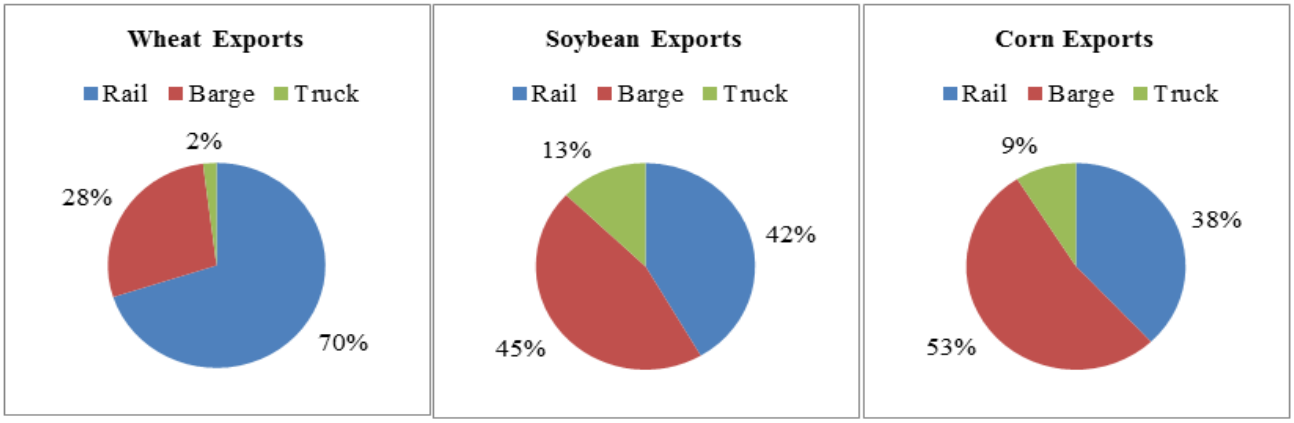
Agricultural exports in Minnesota have nearly tripled in the last decade and accounted for $8.2 billion in revenue in 2012. [56] This trend continues: In 2014 the U.S. Department of Agriculture announced record-setting values for U.S. agricultural export. [57] Unpredictable rail service can jeopardize Minnesota producers' ability to stay competitive in overseas markets. This is especially true for soybeans, the state's major agricultural export. Most soybeans are shipped between October and February, and any delay risks losing market access, particularly to South America. Brazil and Argentina, the second and third largest soybean producers, harvest and export their soybeans in late-February or March.

[54] Analysis by Minnesota Department of Commerce and Department of Transportation. 2014.
[55] Shaffer, D. (2014, March 21). Rail Delays Hurt Energy and Commodities. *Star Tribune.* Retrieved from: http://www.startribune.com/business/251623281.html
[56] U.S. Department of Agriculture, Economic Research Service. 2013. U.S. Agricultural Exports, Commodity detail by State [New series]: CY2000-2012. http://www.ers.usda.gov/data-products/state-export-data.aspx
[57] U.S. Department of Agriculture, Office of Communications. (2014). Statement from Agriculture Secretary Tom Vilsack on 2014 U.S. Agricultural Exports Setting New Record, Press Release No. 0247.14. Retrieved November 2014, from http://www.usda.gov/wps/portal/usda/usdahome?contentid=2014/11/0247.xml&contentidonly=true

Grains and oilseeds are shipped by rail, barge, and truck. Major Minnesota agricultural commodity exports, like corn, soybeans, and wheat depend mostly on rail and barge services to move crops to ports; domestic movements are largely handled by trucks.

Figure 11 displays the transportation summaries for the major state exports.[58] As outbound logistics for Minnesota's agricultural production become constrained, supply chain capacity constraints and delays weaken the basis price and reduce cash flow in agricultural areas.

Figure 11: U.S. modal share summary – 5-year average (2006–2011)[59]



Additionally, there are increased carryover storage costs during the season. In 2014, producers and elevators in Minnesota and beyond reached storage limits. Elevators were unable to accept grain from producers as they have run out of storage, waiting for rail cars to haul existing grain. [60]

In a testimony to a joint Minnesota House and Senate panel, Department of Agriculture Commissioner Dave Frederickson said many farmers have been priced out of grain and soybean transport altogether. He noted oil companies were willing to pay up to 500% more for rail cars than in recent years. [61] This price increase cost Minnesota farmers an estimated $109 million between March and May 2014. With the fall of oil prices, rail service has stabilized. However, given the variability of oil prices, congested railways remains a concern for farmers.

Oil by rail displaces more than just soybeans and corn, according to IMPLAN's regional input-output table, other top spenders for rail transport are electric power generation, truck transport (via intermodal operations), flour milling and malt manufacturing, mining iron ore, and animal food manufacturing.[62] Paper mills and breakfast cereal manufacturing are also among the largest regional rail users.

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[58] Sparger, A.,and Marathon, N. *Transportation of U.S. Grains: A Modal Share Analysis*, May 2013. U.S. Department of Agriculture, Agricultural Marketing Service. http://dx.doi.org/10.9752/TS049.05-2013

[59] Sparger, A.,and Marathon, N. *Transportation of U.S. Grains: A Modal Share Analysis*, May 2013. U.S. Department of Agriculture, Agricultural Marketing Service

[60] J. Wilson, L. Mulvany, and M. Durisin. (2014, August 22) *Too Much Corn With Nowhere to Go as U.S. Sees Record Crop* Retrieved December 2014 from Bloomberg: http://www.bloomberg.com/news/2014-08-22/too-much-corn-with-nowhere-to-go-as-u-s-sees-record-crop.html

[61] Avise, J. (2014, September 30). Joint Committee Seeks Answer to Rail Congestion. *Minnesota House of Representatives Public Information Service.* Retrieved from: http://www.house.leg.state.mn.us/sessiondaily/SDView.aspx?StoryID=5317

[62] IMPLAN Group. (2012). IMPLAN System (data and software). Huntersville, North Carolina. IMPLAN (**IM**pact analysis for **PLAN**ning) is an economic impact modeling system used to create models of local economies. IMPLAN enables users to examine state, multi-county, county, and metropolitan regional economies. The model

Silica sand, another major commodity, is used in hydraulic fracturing of the shale oil beds of the Bakken and other fields to release oil and gas.[63] As noted above, natural sand with the specific qualities needed to be what is generically known as a proppant, exists in few places within the U.S., but most notably in Illinois, Wisconsin, and Minnesota. Silica sand has been in increasingly high demand since the start of intensive oil and gas shale development after 2000 and producers are shipping the material almost entirely by rail to these areas.

The movements involve 100 car unit trains of gondolas or covered hoppers, with Minnesota railroad lines seeing roughly two loaded trains moving over the rail system each day, plus the empty return movements. All four Class 1 railroads are involved in these moves. While only a small percentage of rail traffic involves this material shipment, it is a significant and growing addition to the existing mix of rail traffic. Moreover, the silica sand unit train movements tend to use the same main lines that handle the majority of crude oil and grain shipments, exacerbating the main points of congestion in the rail network.

In contrast to railroads, pipelines interact downstream with a narrower set of industries and commodities – mostly in the energy sector (electric power generation, petroleum refineries, natural gas distribution, and transport by air and truck). This means, rather obviously, that a full rail system will directly affect a far wider range of industries than full pipelines.

Upstream economic impacts

Just as there are downstream effects to increased pipeline and rail use, upstream suppliers have demand increases. The top input industries for transport by rail include maintenance and repair construction, securities, commodity contracts, and investments, petroleum refineries, monetary authorities, accounting services, and wholesale trade.[64] For transport by pipeline, they include petroleum refineries, maintenance and repair construction, environmental and professional services, employment services, and monetary authorities.

In the IMPLAN model, upstream inputs include only management of these industries. There is no explicit category for pipeline and rail construction in the Bureau of Economic Analysis input-output table. Instead, the Bureau groups it in the broader "construction of other new nonresidential structures." This level of aggregation makes it difficult to determine upstream suppliers. Nevertheless, some of the relevant suppliers for this category include architecture and engineering services, petroleum refineries, wholesale trade, monetary authorities, concrete and asphalt manufacturing, and fabricated metals manufacturing.[65]

Not highlighted in that grouping is the obvious need for steel products in pipeline construction. In the U.S. in 2012, there were 9.6 million metric tons of oil and gas pipe products demanded. Of that product

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incorporates social accounting matrices (SAMs) – an extension of input-output accounts, and the resulting SAM multipliers.

[63] A proppant is a small particle of material that holds open the cracks forced into the underground rock formations by the hydraulic fracturing to let the oil flow freely to the collection pipe in the well bore. A proppant may be natural sand grains, a resin-coated sand, or a manufactured ceramic particle. In each case, the particle must be able to stand extreme pressure (14,000 PSI or more) without crushing, be smooth enough to easily penetrate the cracks during the water injection process, and be consistent in size and purity to allow easy management of the slurry and predictable performance during fracking operations.

[64] IMPLAN Group. (2012). IMPLAN System (data and software). Huntersville, North Carolina.

[65] Ibid

demand, 42% was in welded steel and 49% was in seamless steel, with the rest in fittings and plastic products.[66] Demand for oil and gas piping is projected to expand 4.9% annually from 2012 to 2017.

The presence of these upstream effects means that the proliferation of pipelines and railroads will offer new sources of product demand for Minnesota industry suppliers.

Employment and wages in pipeline and railroads

It is difficult to evaluate the number of pipeline and railroad employees. No complete data exist to compare the two modes, but a variety of sources can give a sense of the scale of ongoing operations.

Data from the Bureau of Labor Statistics shows Minnesota had 619 jobs in pipeline transportation and 1,575 employees in oil and gas pipeline construction in 2014. [67] Support activities for rail transportation employed 1,266 Minnesotans in 2014. Unfortunately, direct comparison with ongoing rail transportation is not possible because of incomplete data. Another private data source, the National Establishment Time-Series Database, indicates that companies engaged in railroad line-haul operating and switching and terminal establishments employed 3,580 Minnesotans in 2012.[68]

Table 2: Total private Minnesota employment and wages in pipeline and rail industries (2014)[69]

NAICS	Industry	Employment	Annual Wages per Worker
486	Pipeline transportation	619	$106,625
23712	Oil and gas pipeline and related Structures Construction	1,575	$89,443
488210	Support activities for rail transportation	1,266	$68,657
N/A	Railroad transportation*	NA (est. 3,580 in 2012)	NA

The top three pipeline transportation (NAICS 486) occupations related to ongoing operations in Minnesota employed over 6,000 individuals The top four-rail transportation industry (NAICS 482) related occupations employed nearly 2,700 Minnesotans. Industry wages generally exceed the average state wage of $50,100 in 2013.

[66] Oil & Gas Pipe: United States. (2013, October). *Freedonia Focus Reports.*

[67] The BLS defines Pipeline and Rail Transportation and Oil and Gas Pipeline & Related Structures Construction as: Industries in the Rail Transportation subsector provide rail transportation of passengers and/or cargo using railroad rolling stock. The railroads in this subsector primarily either operate on networks, with physical facilities, labor force, and equipment spread over an extensive geographic area, or operate over a short distance on a local rail line. Industries in the Pipeline Transportation subsector use transmission pipelines to transport products, such as crude oil, natural gas, refined petroleum products, and slurry. Industries are identified based on the products transported. The oil and gas pipeline & related structures construction comprises establishments primarily engaged in the construction of oil and gas lines, mains, refineries, and storage tanks. The work performed may include new work, reconstruction, rehabilitation, and repairs. Specialty trade contractors are included in this group if they are engaged in activities primarily related to oil and gas pipeline and related structures construction.

[68] Walls, Donald W. (2014). National Establishment Time-Series Database, 1995-2012. Establishments with SIC 4011 or 4013 and FIPS 27; The Association of American Railroads reported 4,095 railroad employees in Minnesota in 2010 (http://bit.ly/1rMUsdo).

[69] First three in list: QCEW, BLS, 2014. Last from NETS, Walls & Associates, 2014.

Multiplier effects of pipeline and rail industries

Economic impact from increased investment in pipeline and rail ripples beyond direct industry employment. Indirect jobs arise from the industry purchasing inputs and workers spending wages in the community.

Construction phase

New construction of either pipeline or railroads boosts demand for labor in construction occupations and for products in related industries (for example, metal suppliers, compressors/pumps, digging equipment, and monitoring systems). The IMPLAN model classifies construction of railroads and pipelines in the non-descript "construction of other new nonresidential structures" Industry. For this industry, every $1 million in spending will create nearly 13 jobs in the Minnesota economy.[70] In employment multiplier terms, every job created results in 2 total jobs added to the broader economy.[71]

This construction multiplier has particular relevance as both rail and pipeline companies are making major state investments in the coming years. In 2014, Minnesota's railroads were spending more than $100 million in capital expenditures and maintenance activity. They forecasted spending more than $250 million annually over the next three years to address capacity shortfalls.[72] Exact spending on capital expenditures and maintenance by pipeline companies during the same period is unknown. For comparison, Enbridge anticipates the Sandpiper pipeline project would require a $2.6 billion investment over a three-year period. The proposed pipeline would carry light crude across Minnesota, North Dakota, and Wisconsin. While this spending is meaningful, the major impact is the one-time outlay for initial construction; with ongoing maintenance and operation contributing a smaller percent of the total economic impact.

Operations phase

As new railroads and pipelines are constructed, industries hire additional workers to manage the expanded operations. Every $1 million increase in rail and pipeline industry sales in Minnesota will lead to the hiring of approximately 9 Minnesotans. The same increase in sales for rail transportation results in an increase of 9.7 jobs. In employment multiplier terms, every job in rail and pipeline transport means 2.9 and 2.6 total state jobs, respectively.[73] Put another way, one job in pipeline or rail translates to approximately 2.5 additional jobs in other Minnesota industries. However, ongoing operations in rail and especially pipelines require relatively few employees. For example, a 2014 State Department report anticipates that the northern leg of the Keystone XL project will only support 35 permanent and 15 temporary operations jobs across the four states the pipeline travels.[74]

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[70] IMPLAN Group. (2013). IMPLAN System (data and software). Huntersville, North Carolina. Jobs are specified in "job years." E.g., if $1 million in spending occurs in a year, we expect that number of jobs for the one year of the spending. We expect ongoing year-to-year spending and jobs for the operations phase, but construction spending is expected to last only a short period.

[71] The multiplier is equal to (direct effect + indirect effect (from supplier) + induced effect (from wages)) / (direct effect).

[72] Proceedings from Minnesota Rail Summit. (2014, November 17). St. Paul, Minnesota.

[73] IMPLAN Group. (2013). IMPLAN System (data and software). Huntersville, North Carolina.

[74] Final Supplemental Environmental Impact Statement for the Keystone XL Project. (2014, January). *U.S. Department of State.* Retrieved from: http://keystonepipeline-xl.state.gov/documents/organization/221135.pdf

Impact on other industries from ongoing operations

Though pipeline and rails have similar multiplier effects, they interact differently with Minnesota industries. The tables below demonstrate the economic response for every $1 million increase in industry sales. [75] Labor income represents wages paid to workers. Value added is the impact on state gross domestic product (GDP).

Table 3: Top five industries affected by $1M increase in pipeline transportation sales ($2015)[76]

IMPLAN sector	Description	Employment	Labor income	Value added
413	Pipeline transportation	3.6	$460,178	$619,474
464	Employment services	0.34	$10,654	$12,961
62	Maintenance and repair construction of nonresidential structures	0.32	$22,739	$23,715
440	Real Estate	0.230	$5,257	$36,889
48	Hospitals	0.2	$14,529	$15,271

Table 4: Top five industries affected by $1M increase in railroad transportation sales ($2015)[77]

409	Rail Transportation	3.21	$346,543	$387,224
395	Wholesale trade	0.38	$35,145	$59,592
434	Nondepository credit intermediation	0.210	$19,764	$22,631
482	Hospitals	0.18	$13,135	$13,839
435	Securities and commodity contract intermediation and brokerage	0.26	$13,135	$8,477

[75] The IMPLAN model assumes an economy will react to new demand in a "normal" way. In other words, industries will fill demand for labor and supplies with local products in line with historical rates. In the case of a large project, local supplies of labor, capital or other inputs may not be able to meet that demand and producers will import supplies. If this occurs, the estimates may be overstated.
[76] IMPLAN Group, 2015; Analysis by DEED Economic Analysis Unit.
[77] Ibid.

Economic impact summary

The construction and management of pipelines and railroads has ramifications on the broader Minnesota economy. Jobs in these areas tend to produce above-average wages and have strong multiplier effects. Results from the IMPLAN model found a $1 million investment in construction of pipelines results in about 13direct and indirect jobs. One direct job in pipeline operations means approximately 1.6 additional jobs throughout the state. While these represent good jobs for Minnesotans, many construction projects have one-time economic impacts; with construction workers shifting to new projects in new areas; after construction is complete.

Employment gains are only one portion of the economic narrative. Minnesota must also weigh the ability of additional rail and pipeline construction to relieve congestion on transportation networks with the risk of negative side effects (for example, personal, environmental, and economic damage related to construction and spills).

Taxes

This section reviews tax laws that govern pipelines transporting crude oil and refined petroleum products in and through Minnesota. The discussion is broken down into three parts – property tax, sales tax, and corporate franchise tax.

Property taxes

Property tax is a levy-based, "ad valorem" tax. This means that property is taxed according to its estimated market value. Property tax is a source of revenue for local taxing jurisdictions as well as the state general fund.

A levy-based property tax system starts with local taxing jurisdictions determining the amount of revenue needed from the property tax levy. The levy is then spread among all taxable properties in the jurisdiction. The state general property tax works in the same way with the state general levy being set by legislature. Because the property tax levy is a set amount, if one property or type of property pays more in tax, other properties or property types will pay less. The addition of new property does not generate any new local or state property tax revenue.

Local taxing jurisdictions impose property tax on that portion of the pipeline's taxable market value attributable to the portion of the pipeline located within the local jurisdiction. The state imposes property tax on that portion of the pipeline's taxable market value attributable to the portion of the pipeline within the state.

Determining taxable market value for pipelines

Pipelines are valued under a "dual" property tax system:

- The Department of Revenue values the pipeline's operating property, which includes items like pipes and pumping stations.
- Land or other real property owned by pipeline companies that is not part of the operating property is assessed locally by a city or county assessor.

To value the pipeline's operating property, the Department of Revenue uses the "unit value" method.

First, the unit value is determined. This value includes the entire system, which may be spread over many counties, states, or even countries. A variety of models, such as the depreciated original cost model, market data of equity and debt models, and anticipated income-based valuation models are completed. Then the results of these different models are compared and reconciled to determine the unit value.

Next, the portion of the unit value attributed to Minnesota is calculated based on percentages of cost and income within Minnesota as compared to the entire system. The value of property that is exempt or locally assessed is removed. The remaining statewide value is spread out among all of the different parcels in all of the local jurisdictions where the property is located.

Finally, these values may be equalized with other property in each county that is classified as Commercial/Industrial, which is the same classification for pipeline property. The Department of Revenue certifies these equalized values for each parcel to the counties, where they are combined with the locally assessed values to determine the taxable market value for each parcel.

Using taxable market values to calculate property tax

After each parcel's taxable value is established, pipeline property is treated like other business property for property tax purposes. There are three components to the parcel's tax: 1) the state property tax, 2) the local jurisdiction net tax capacity taxes, and 3) local jurisdiction referendum market value taxes.

The parcel's taxable market value is multiplied by its classification rate to determine its net tax capacity. The classification rate for pipeline property, as well as for most other business property, is 2% of market value. [78]

A parcel's net tax capacity is multiplied by the state property tax rate to determine the parcel's state property tax. The state property tax rate is based on the legislatively mandated state general levy divided by the net tax capacity of the affected properties. Revenue from this tax goes to the state general fund.

A parcel's net tax capacity is multiplied by the local tax rate to determine the parcel's local jurisdiction net tax capacity tax. The local tax rate is based on the property tax revenue needed, divided by the total tax capacity. [79] This tax is distributed to the city, county, school, and special taxing districts that contain the parcel.

Finally, the parcel's taxable market value is multiplied by the local jurisdiction's referendum market value rates to determine the parcel's referendum market value taxes. Most referendum taxes go to school districts, with a small portion for cities and counties.

Table 5: A parcel's total property tax equals the sum of the following three taxes

State property tax	=	parcel taxable market value × classification rate (2%) × state tax rate (52.16% for 2014)
Local jurisdiction net tax capacity	=	parcel taxable market value × classification rate (2%) × local net tax capacity rate (rates vary by jurisdiction[80])
Market value tax	=	parcel taxable market value × local referendum rates (rates vary by location[81])

Property tax paid by pipeline companies

There are two main types of transportation pipeline in Minnesota – petroleum and natural gas. There are about 4,100 miles of petroleum pipeline in Minnesota. There are about 5,500 miles of natural gas pipeline. Table 6 identifies the estimated 2014 taxable market value of and property taxes paid by petroleum and natural gas pipeline.

Table 6: Estimated 2014 taxable value and property taxes paid ($ millions)

Property type	Miles	Taxable market value	State tax	Local taxes	Total taxes	Effective tax rate
Petroleum	4,100	$2,139	$20	$52	$72	3.3%
Natural gas	5,500	$960	$9	$23	$32	3.3%
Overall commercial and industrial		$68,795	$687	$2,001	$2,688	3.9%

[78] Per M.S. 273.13, subdivision 24, most commercial, industrial, and utility property is classified as 3a and has a classification rate of 1.5% on the combined real and personal property on the first $150,000 of value of each entity in each county, then 2% on the remaining value. However, personal property that is tools, implements, and machinery has a classification rate of 2% on its entire market value.

[79] The total property tax revenue needed for a local jurisdiction equals the total proposed local budget minus all non-property tax revenue (state aid and fees). The total tax capacity for a local jurisdiction equals the total taxable market value in that jurisdiction multiplied by the classification rate.

[80] In 2013, this rate ranged from 34% to 406%, with a mean of 98% and median of 92%.

[81] In 2013, this rate ranged from 0% to 0.87%, with a mean of 0.21% and median of 0.18%.

Sales and use tax

Sales tax is a transactional tax that applies to Minnesota retail sales of taxable services and tangible personal property. A "retail sale" means any sale, lease, or rental of tangible personal property for any purpose other than resale, the sale of certain services, and the sale of specified digital goods. Businesses collect sales tax on goods and services sold at retail and remit the sales tax on behalf of the purchaser to the state.

Use tax is due on taxable goods and services used in Minnesota if no sales tax was paid at the time of purchase. If an out-of-state seller does not collect any sales tax on taxable goods, or collects tax at a lower rate, then the purchaser must pay use tax directly to the state.

The Minnesota state sales and use tax rate is 6.875%. A portion of the state sales and use tax equal to 6.5% is deposited in the state's general fund. The remainder, equal to 0.375%, is deposited in the state's legacy funds to benefit Minnesota's natural and cultural resources. Some local governments impose a local general sales tax, usually to fund a specific capital project. The current rates for these local taxes rates range from 0.15% to 1.0%.

Generally, pipeline companies are considered to be in the "midstream" portion of the energy sector. They do not usually own the products they are transporting. They are transportation intermediaries that move the product from the producers and shippers to the marketplace. Producers and shippers pay pipeline companies to transport their product. Transportation services are not subject to sales tax under current law. Thus, pipeline companies do not collect sales tax from their customers that purchase transportation services.

Pipeline companies do, however, pay sales or use tax on purchases of pipeline materials. These materials include things like pipe, fittings, valves, nuts, bolts, and tools used in construction. The materials do not qualify for any exemption in Minnesota because the pipeline company is not considered to be engaged in industrial production. Similarly, the purchase of gas as compressor fuel to be used by the pipeline companies in their compressors within the pipeline system is subject to sales or use tax.

Sales and use tax exemptions

Minnesota has three categories of exemptions:

- User exemptions such as resale and industrial production
- Product exemptions such as food and food ingredients, and clothing
- Entity exemptions such as federal government and certain nonprofit organizations

In general, sales of tangible personal property are subject to sales and use tax in Minnesota unless there is an exemption. Sales of services, including transportation services, are generally not subject to sales and use tax unless explicitly made taxable by Minnesota statute.

Sales and use tax paid by pipeline companies

For new pipelines in 2013, taxable pipeline materials accounted for approximately 42% of construction expenditures. These taxable pipeline materials are subject to the sales and use tax rate of 6.875%. Labor accounted for about 50% of construction expenditures, with land and right-of-way expenses making up much of the rest. Labor and these other expenses are not subject to sales and use tax. The materials cost for each mile of new pipeline construction was reported to cost between $100,000 and $1.2 million

nationally ($6,875 to $82,500 in sales and use tax per mile at the Minnesota rate) in 2013.[82] New pipeline construction in Minnesota would have been expected to generate about $20,000 to $40,000 in sales and use tax revenue per mile in 2013.

Table 7: Minimum fee schedule

Value of Minnesota property, payroll, and sales	Minimum fee amount
Less than $930,000	$0
$930,000 - $1,869,999	$190
$1,870,000 - $9,339,999	$560
$9,340,000 - $18,679,999	$1,870
$18,680,000 - $37,359,999	$3,740
$37,360,000 or more	$9,340

For existing pipelines, sales or use tax is paid on most materials purchased for ongoing maintenance and repair. In 2012, when there was no significant new construction, pipeline companies in Minnesota (including crude oil, refined products, and natural gas) remitted approximately $2.2 million in use tax. Additionally, sales tax was likely collected and remitted by other businesses for taxable maintenance and repair materials those suppliers sold to the pipeline companies. The fiscal year 2012 statewide total sales and use tax remitted for all taxable transactions was about $5 billion.

Corporate franchise tax

Corporations that operate in Minnesota are subject to Minnesota's corporate franchise tax. The tax base begins with federal taxable income with some state modifications. For Minnesota purposes, this is known as net income. Corporations that have a common owner and operate together in a manner that provides a flow of value between them are known as unitary groups and are required to report the income of all member corporations on a combined return.

Many corporations operate in more than one state. Under the U.S. Constitution, a state can tax only the income of a business that is "fairly apportioned" to its activity in the state. Starting in tax year 2014, Minnesota's formula apportionment is determined by calculating a percentage equal to a corporation's sales to Minnesota customers, divided by all of the corporation's sales. This is referred to as the sales factor. Taxable net income is determined by multiplying net income by the sales factor:

$$Net\ Income\ \times \frac{Sales\ to\ MN\ Customers}{Sales\ to\ All\ Custumers}\ = Taxable\ Net\ Income$$

After a corporation's taxable net income is determined, it is reduced by loss carryovers and certain other modifications to arrive at taxable income, which is multiplied by the corporate income tax rate of 9.8% to determine the corporation's tax. The tax may then be reduced by various tax credits.

In addition to the corporate franchise tax, a minimum fee based on the sum of the corporation's Minnesota property, payroll, and sales is also imposed. The schedule for the fee, indexed for inflation each year, is shown to the right.

[82] Oil & Gas Journal, 9/1/2014 "Crude oil pipeline growth, revenues surge; construction cost mount." In 2013, the range of costs for industry reported national pipeline construction was large and depends on a variety of factors, including pipeline diameter, year to year materials cost changes, geographic location, terrain, and population density. In addition, the cost appears to be increasing faster than inflation over time.

Revenues from the corporate franchise tax and the minimum fee are deposited in the state general fund.

Corporate franchise tax applicability

If a pipeline company is organized as a corporation and operates a pipeline in Minnesota, then the company is subject to the corporate franchise tax.

For apportionment purposes, sales from providing transportation services are attributed to where the product is delivered. In other words, taxable net income is determined by multiplying net income by the sales factor:

$$Net\ Income\ \times \frac{Sales\ for\ Product\ Delivered\ to\ MN\ Destinations}{Sales\ for\ Product\ Delievered\ to\ All\ Destinations}\ = Taxable\ Net\ Income$$

A pipeline that runs through Minnesota and has destination terminals in Minnesota will have sales for product delivered to a Minnesota destination. As a result, the sales factor will be greater than0 % and results in some Minnesota corporate franchise tax. A pipeline that runs through Minnesota, but does not have a destination terminal in Minnesota will have no sales for product delivered to a Minnesota destination. As a result, the sales factor will be 0% and results in no corporate franchise tax. There are about 14 unitary groups filing Minnesota corporate franchise tax returns that include pipeline activity within Minnesota. Of these, the amount of corporate franchise tax has varied over the past three years, ranging between $500,000 and $1.3 million, while over the same timeframe, the total corporate tax paid in Minnesota averaged about $1.2 billion per year.

Constitutional provisions

Minnesota, like all states, needs to consider constitutional provisions, including the commerce clause and foreign commerce clause, when developing tax policy and law.

The commerce clause grants Congress the power to regulate commerce among the states.[83] The United States Supreme Court has long held that a negative implication of this grant of power is that states may not adopt regulations or taxes that place an "undue burden" on interstate commerce, even if Congress has taken no action. The most obvious discriminatory taxes explicitly tax out-of-state parties while not taxing in-state parties. Taxes that are facially neutral, but have a disparate impact on out-of-state parties are similarly invalid under the dormant commerce clause.

The foreign commerce clause grants Congress the power to regulate commerce with foreign nations. [84] When evaluating the foreign commerce clause, a two-prong test is considered: 1) whether the tax, notwithstanding apportionment, creates a substantial risk of international multiple taxation; and 2) whether the tax may impair federal uniformity and prevent the federal government from speaking with one voice when regulating commercial relations with foreign governments.

[83] U.S. Const. art. II, § 8.
[84] U.S. Const. art. I, § 8, cl. 3

Findings and considerations

The transport of crude oil includes economic benefits and risks to Minnesota citizens. In order to fully assess these potential impacts, it is essential to understand how and where costs are being assessed; in order to determine if they are sufficient.

Market uncertainty and oil production

- In the short term, oil price fluctuations have little impact on production in North Dakota – large capital investments by oil firms take time to wind down. In the long term, declining prices would lead to declining production.
- The average breakeven point varies from region to region. IHS Global Insights estimates that most tight oil additions have a breakeven point between $50and $69 per barrel. North Dakota's Department of Mineral Resources estimates breakeven points as low as $27 a barrel in North Dakota's Dunn and McKenzie counties.

Transportation

- The continuing growth of Canadian and Bakken crude oil production will ensure full use of all existing and proposed pipeline capacity. Railroads are the primary alternative for oil not shipped by pipeline; with demand increasing when pipelines reach their current capacity.
- Assuming pipeline and railroads are directly substitutable would be a simplification. In many ways, they act like complements. Producers frequently transport oil by both modes on its way from well to refinery.
- The high degree of product pipeline interconnection between the Midwest and the Gulf and East Coasts, reduces price volatility for consumers in the Midwest. Increased pipelines can connect regions, pooling risk and insulating regions when they experience a supply disruption.
- Additional rail and pipeline construction should decrease present system congestion; the state must still continue to weigh the relative merits and impacts of each mode to determine the amount and mix of transport.

Jobs

- The construction and management of transportation by pipelines and railroads add valuable jobs to the Minnesota economy; with the construction phase providing the most economic impact.
- Every $1 million in pipeline construction spending creates 13 direct and indirect jobs in Minnesota economy. In employment multiplier terms, one pipeline construction job results in one additional job in the state.
- On the ongoing operations side, every $1 million increase in pipeline industry sales by Minnesotan firms leads to approximately 9 jobs in the state. In employment multiplier terms, one pipeline operations job results in 1.6 additional jobs in the State, respectively. Moreover, these jobs tend to pay above average wages.
- Economic impacts for construction and operation of rail transportation are similar to pipeline transportation.

Taxes

- Property tax is levy-based and is imposed on that portion of the pipeline's taxable market value attributable to the portion of the pipeline located within the local jurisdiction. Pipelines are valued under a "dual" property tax system:

- The Department of Revenue values the pipeline's operating property, which includes items like pipes and pumping stations.
- Land or other real property owned by pipeline companies that is not part of the operating property is assessed locally by a city or county assessor.

- Sales tax is a transactional tax that applies to Minnesota retail sales of taxable services and tangible personal property. Regarding pipelines, sales and use tax is generated primarily during the construction phase when the tangible personal property is purchased. For every $1 million of new pipeline construction expenditures, the taxable pipeline materials would be approximately $420,000, which could generate around $28,875 in sales and use tax revenue.
- Corporations that operate in Minnesota are subject to Minnesota's corporate franchise tax. There are about 14 unitary groups filing Minnesota corporate franchise tax returns that include pipeline activity within Minnesota.

Summary of public comments

During public review of this report, some economics-related comments received expressed the following:

- Concern for current economic impact of rail congestion on the transport of other commodities; caused by increased oil transport through Minnesota
- Concern about the potential for unexpected additional costs to local communities, and the State, of transporting oil across the state, such as: lost land usage opportunities, staffing for emergency preparedness response, potential clean-up costs from environmental damage.
- Additional information should be provided on the potential costs to citizens of Minnesota for maintenance, removal, and potential environmental damages from, abandoned pipes
- Concern that jobs assessments consider the economic impact from both the transient pipeline construction-related jobs and permanent operation and maintenance-related jobs.
- More assessment needed for potential economic impacts to a local community, including:
  - Understanding financial benefits to counties,
  - Understanding the economic after-effect of spills and explosions,
  - Potential impacts to tourism related jobs,
  - Potential depreciated property values that may result from proximity to project, and
- Concern that the positive interactions experienced between pipeline workforces and communities were not described in the Report.

More study needed

Economics-related issues identified for more study include:

- Understanding the analytical methods for assessing the true state and local costs and benefits and risk for all modes of crude oil transport in Minnesota.
- Understanding potential long-term economic impacts of abandoned pipes
- Understanding the process for determining compensation and carrying out eminent domain practices.

Environmental and human health impacts

This section does not represent an exhaustive list of the environmental and human health risk associated with pipeline construction and operation; rather it is a high-level review of the potential impacts. In instances where there is a proposed pipeline route, the site specific concerns may be different and individually evaluated and addressed during the approvals process. The environmental and human health concerns raised by state agencies cover a wide range – some of which involve both local concerns and some national and global concerns.

The environmental resources potentially impacted by pipelines can be summarized in the following groups:

- Soils and agricultural resources
- Public lands
- Vegetation
- Wildlife and fisheries
- Surface and groundwater
- Climate change – environmental impacts

The human health concerns associated with pipelines can be summarized in the following groups:

- Environmental justice and health equity
- Social determinants of health
- Potential hazardous materials
- Climate change – human health impacts
- Worker influx

Potential environmental resource impacts

Soils and agricultural resources

Pipelines traversing Minnesota cross through different soil types and varied topography. Potential impacts include soil erosion, loss of topsoil, soil compaction, an increase in the proportion of large rocks in the topsoil, soil mixing, soil contamination, and related reductions. Water quality can be impacted by erosion and sedimentation caused by construction and other pipeline related operations. Pipelines can adversely impact farms by interfering with agricultural operations, damaging crops, and damaging structures and other land improvements on the farm.

- **Soil mixing –** A potential impact of pipeline construction is the mixing of topsoil and subsoil during construction of the pipeline trench. Soil can be mixed together from the digging of the pipeline trench and the subsequent burial of the pipeline with stockpiled soil. By mixing topsoil and subsoil, the organic matter and nutrients contained in the topsoil are diluted, which impacts agricultural productivity. Once mixing has occurred, it is very difficult and costly to mitigate. Rocks may also be brought to the surface during construction and their removal can be costly to farmers. Soil mixing in non-agricultural areas, such as forests, also impact the types of vegetation that can re-grow and potentially introduce invasive plant species. Top soil may be stripped and stock-piled alongside the trench to reduce impacts.
- **Soil compaction –** The pressing together of soil particles such that the pore space between the particles is reduced, thereby reduces water, nutrients, and the exchange of gases for plant roots. In pipeline construction, the biggest culprit in compaction is often the "stringing truck" that delivers pipe to the construction site. Compaction and mixing from construction can be made worse by wet soils or fine-textured soils. Soil compaction can have an adverse impact to both agricultural and non-agricultural lands; such as wetlands.
- **Subsidence** – Subsidence of soils can result from winter construction of pipelines. Upon backfilling after pipe placement, the frozen soils stay as frozen chunks with air voids rather than loose dirt. In the springtime, as the soil thaws, the soil particles break apart which fill the air voids often resulting in settlement in the form of a depression or ditch in the field over the pipeline, sometimes several feet deep. The main concern regarding this issue is that the depression or ditch can act as a conveyance for water which can transport sediment and other contaminants to surface waters. This could potentially be mitigated by placement of straw wattles or biologs over the trench when it is filled, so that the wattles would subside with the soils in the spring and potentially create temporary ditch checks to slow runoff until repairs could be made
- **Drainage –** Pipeline construction or large pipeline installation in crop fields can damage or obstruct drainage systems. Agricultural water management is critical for productive agriculture. Subsurface drainage and drainage ditches are installed below the surface of fields to maintain drainage. Pipeline construction is often at a depth greater than the depth of subsurface drain tile, and so drain tile is often severed, and repair is required. In addition, when pipelines are of a large diameter, they can create an obstacle to drainage if they are at the same depths required for installation of drain tile.
- **Impacts to organic farms – I**n contrast to conventional farms, organic agriculture poses a special set of issues. Because organic farming operations are unable to use synthetic pesticides and fertilizers, soil tilth, the combination of soil structure, organic matter, nutrients, and other factors important to plant growth, is especially important for an organic farm to maintain. The high level of soil tilth for an organic farm requires a considerable investment of effort and years to achieve. Standard mitigation and restoration required of pipeline projects will not prevent loss

of soil tilth, and the time required to restore it can also take years, with the potential for considerable economic loss.

- In addition to the importance of maintaining soil tilth is the risk of loss of organic certification. The U.S. Department of Agriculture organic certification prohibits most synthetic herbicides and pesticides, and requires a transition period of 36 months prior to certification during which no synthetic inputs are used. The potential introduction of prohibited substances, such as leaked fluids from construction equipment, or pesticides in water flowing in the pipeline trench from a neighboring farm, can threaten an organic farm's certification.

Public lands

The crossing of public lands can affect natural communities, habitat, and the quality of recreational experiences and in some cases can conflict with the purposes for which certain areas were established. Some public lands, such as Wildlife Management Areas and waterfowl production areas, are not explicitly protected from pipeline development while other lands, such as in scientific and natural areas, [85] and state parks, are generally protected. The following areas may or may not have existing protections from pipeline construction, but all areas have valuable resources and ecological communities that are put at risk with pipeline development:

- **Aquatic management areas –** These areas are established, "to protect, develop, and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses." [86]
- **Wildlife management areas –** Wildlife management areas are established, "to protect those lands and waters that have a high potential for wildlife production and to develop and manage these lands and waters for the production of wildlife, for public hunting, fishing, and trapping, and for other compatible outdoor recreational uses." [87]
- **State conservation easements –** Conservation easements[88] refer to, "nonpossessory interest of a holder in real property imposing limitations or affirmative obligations the purposes of which include retaining or protecting natural, scenic, or open-space values of real property, assuring its availability for agricultural, forest, recreational, or open-space use, protecting natural resources, maintaining or enhancing air or water quality, or preserving the historical, architectural, archaeological, or cultural aspects of real property." [89]
- **Prairie bank easements – A** native prairie bank easement is a voluntary agreement between a landowner and the Department of Natural Resources. The landowner agrees to manage the land under an easement in ways that protect the native prairie in exchange for payment. Each easement is tailored to the unique character of the land and desires of the landowner, with common protection features such as no plowing or building on the native prairie.
- **State parks –** State parks are established, "to protect and perpetuate extensive areas of the state possessing resources which illustrate and exemplify Minnesota's natural phenomena and to provide

[85] Minn. Stat. Section 86A.05, subd. 5; Minn. Rules Chapter 6136
[86] Minn. Stat. § 86A.05
[87] Ibid.
[88] Minn. Stat. Chapter 84C
[89] Minn. Stat. § 86C.01

for the use, enjoyment, and understanding of such resources without impairment for the enjoyment and recreation of future generations." [90]

- **State recreation areas –** Recreation Areas are established, "to provide a broad selection of outdoor recreation opportunities in a natural setting which may be used by large numbers of people." [91]
- **State forests –** State forests are established, "…for growing, managing, and harvesting timber and other forest crops and for the establishment and development of recreational areas and for the protection of watershed areas, and the preservation and development of rare and distinctive species of flora native to such areas." [92]
- **DNR Division of Forestry administered lands and School Trust Fund lands –** Pipeline construction and maintenance through these lands might be detrimental to future revenues. Encumbrance of land affects the economic value of parcels, limiting economic uses for the right of way and possibly in the vicinity of the right of way. Examples of effects are loss of future timber harvest or encumbrance of minerals or aggregate. Routes passing through School Trust Lands must produce maximum long-term economic return for the trust. Normal reimbursement for existing timber would be common to all forest lands, but land types will impact specific compensation, and there may be variability in required compensation.
- **State trails – S**tate trails are established "to provide a recreational travel route which connects units of the outdoor recreation system or the national trail system, provides access to or passage through other areas which have significant scenic, historic, scientific, or recreational qualities or reestablishes or permits travel along a historically prominent travel route or which provides commuter transportation." [93] Minnesota also has a network of state water trails, providing recreational opportunities such as canoeing and boating. Pipeline projects crossing rivers might require use of temporary bridges, and crossings of trails require detours. Temporary bridges and other trail obstacles that are kept in place during the construction period will be obstacles to such traffic, and perhaps at times involve safety issues.
- **Other public and nonprofit lands – Ot**her public and non-profit lands such as the U.S. Fish and Wildlife waterfowl productions areas, national wildlife refuges, and the Nature Conservancy lands can also be affected by pipeline construction and operation.

Vegetation

Potential construction and operations related impacts to general terrestrial vegetation resources associated with the pipelines can have short term and long term consequences, including habitat loss, degradation, and fragmentation. High quality, high value natural communities, described below with wetlands and other large blocks of habitats are put at risk particularly during pipeline construction. Some of the following landscapes and ecosystems are afforded protections under state and federal law, while others are not and therefore are at greater risk of being impacted:

- **Peatland scientific and natural areas –**Approximately 6 million acres of peat organic soils and native plant populations of spruce, tamarack, and sedges exist in Minnesota. Peatlands serve as important water reservoirs, the significance of which has yet to be fully understood. Construction

[90] Minn. Stat. § 86A.05
[91] Ibid.
[92] Ibid.
[93] Ibid.

of new corridors of disturbance associated with pipelines through peatlands is a prohibited activity. [94]

- **Calcareous fens –** Many of the unique characteristics of calcareous fens[95] result from the upwelling of groundwater through calcareous substrates making them rare and distinctive wetlands. Fens are highly dependent on delicate groundwater hydrology and can be indirectly affected by activities several miles away from the fen.
- **Native prairie –** Native prairie once abundant, is now a rare ecosystem. More than one-third of Minnesota's endangered, threatened, and special concern species are dependent on the remaining small fragments of Minnesota's prairie ecosystem. These lands include grassland that has never been plowed and contains floristic qualities representative of prairie habitats.[96] Given the rarity of native prairies and the potential for state-listed species to occur within native prairie habitat, it is ideal to avoid all native prairie remnants. If avoidance is not feasible, rare species surveys may be required.
- **Areas of biodiversity significance and native plant communities –** A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site. These ranks are used to communicate the statewide native biological diversity significance of each site to natural resource professionals, state and local government officials, and the public. The biodiversity ranks help to guide conservation and management.
- **Rare natural plant communities –** Permanent impacts to rare natural communities are not allowed by the Wetland Conservation Act. [97] Rare natural communities under the act have a prescribed conservation status, are mapped or determined eligible by the Department of Natural Resources to be eligible for mapping by the Natural Heritage Information System, [98][99] while local government units are responsible for determining whether permanent impacts to rare natural communities will occur.
- **Old growth forests, ecologically important lowland conifers, representative sample areas, and high conservation value forests –** In accordance with the Department of Natural Resources forest management policy the avoidance of all old growth special management zones (330 feet surrounding the old growth perimeter) is necessary to maintain statewide forest certification. The department's land management policies provide guidance for License to Cross Public Lands and Waters conditions when a utility crosses public lands and may be required with license conditions. The department encourages the avoidance of all ecologically important lowland conifers, representative sample areas.

Wildlife and fisheries

Pipeline construction results in the loss and fragmentation of wildlife habitat. The pipelines themselves do not impair the movement of species along migration corridors. However, a cleared and maintained right

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[94] Minn, Stat. § 84.035 Subd. 5(a)5
[95] The DNR maintains a list of known calcareous fens, which is available at the DNR's website at: http://www.dnr.state.mn.us/eco/wetlands.html.
[96] See the remaining prairie map at the following site: http://files.dnr.state.mn.us/eco/mcbs/prairie_map.pdf
[97] Minn. Rules. 8420.0515 Subp. 3
[98] See http://www.bwsr.state.mn.us/wetlands/wca/guidance/Rare_natural_communities.pdf.
[99] A crosswalk between NPCs and associated conservation status ranks is available at: http://files.dnr.state.mn.us/natural_resources/npc/s_ranks_npc_types_&_subtypes.pdf.

of way creates barriers to movement for many species, gives advantage to predators, and encourages the spread of invasive species. Special wildlife areas, such as rookeries, Wildlife Management Areas, Scientific and Natural Areas, Prairie Bank Easements, Areas of Biodiversity Significance, and Conservation Focus areas for Species of Greatest Conservation Need are valuable wildlife habitat.

- **Large block habitats –** Large blocks of habitat and habitat complexes such as grassland, wetlands, or forest can provide an increased diversity and abundance of wildlife. Larger, rounder, or square blocks of habitat provide interior habitat that is more isolated from noise, pollution, parasitic birds, and predators associated with edges of fragmented habitat. Direct habitat loss, habitat degradation, and fragmentation can occur when locating pipelines across large blocks of habitat and habitat complexes.
- **Rare species –** Minnesota endangered species law[100] and associated rules[101] prohibit the taking of endangered or threatened species without a permit. Surveys may be required in order to determine if takings may occur. Project planning must take into account that some species can only be surveyed at specific times of the year.
- **Species of Greatest Conservation Need and Conservation Focus Areas–** Wildlife that have been identified as rare, declining or vulnerable in Minnesota are directly affected by pipeline construction and ongoing maintenance. Habitat degradation and loss are the two greatest risks to these species. Consequently, pipeline activities have the potential to directly and indirectly affect focus areas and the species that use them. [102]

Similarly, crossing perennial and intermittent streams, cold water and warm water streams, may affect high quality or high value fisheries, such as trout streams. The greatest threat to these habitats occur during construction and would be temporary and include increased siltation, sedimentation, bank erosion, sediment deposition, short-term delays in movements of fish, and the potential for the transport and spread of aquatic invasive animals and plants. Additional impacts may include water quality impairments and channel instability.

Surface and groundwater

During operation, the primary impact of pipelines on surface water and groundwater are the potential release of petroleum during pipeline operation and, to a lesser extent, from fuel spills from equipment. The pipeline will remain a potential hazard to both surface water and groundwater while it is in operation and until it is properly decommissioned. Out of sight leaks can go unnoticed until material emerges in waterways or at the soil surface. Any petroleum releases from construction or operation could potentially impact groundwater where the overlying soils are permeable and/or the depth to groundwater is shallow. Public waters and wetlands are of particular concern.

During construction the potential risks to surface waters such as rivers, streams, wetlands and ditches includes sediment transport, which can structurally and biologically affect the stream; bank slumping, flowing soils, and frac-outs are also potential environmental risks. The possibility of impacts depends on site-specific crossing characteristics and the type of crossing method used.

- **Public waters –** When constructing large linear projects, crossings of public waters in Minnesota will likely be unavoidable. Various impacts can occur during construction, as discussed below.

[100] Minn. Stat. § 84.0895
[101] Minn. Rules 6212.1800 to 6212.2300 and 6134
[102] Subsection profiles (which includes conservation actions and priorities) are available at: http://www.dnr.state.mn.us/ecs/index.html

Pre- and post-construction surveys, restoration requirements, construction monitoring, and potential mitigation measures for where there are greater-than-anticipated impacts can help address these issues. In order to maximize habitat function and to help maintain the natural character, natural restoration methods are best. In order to inform specific crossing requirements and minimize the potential impacts for impacts to public waters, the Department of Natural Resources may require more detailed geological and waters survey information in proximity to more sensitive public water crossings.

- **Wetlands –** A common alteration encountered with pipelines is disturbance to wetlands. Concerns with the disturbance of wetlands include re-establishing pre-existing wetland vegetation, and potential conversion in wetland type to deeper water habitat. For example, as an area becomes wetter, the first effects on vegetation of increased saturation may include the invasion of species more characteristic of marshes. Invasive species such as hybrid cattail may become established, forming monotypic stands with more limited habitat value. The result can be a modification or loss of ecological function and biodiversity. Impacts can be reduced by avoiding and minimizing crossings. Where crossings are needed, winter construction is preferred to minimize wetland impacts due to construction. This is especially important in sensitive and difficult to restore wetlands such as bogs and fens

The following are construction methods and the environmental risk associated with their implementation:

- **Open cut** - This involves digging an open trench across the water body, side casting the spoil material, laying the pipe into the trench, and then backfilling the excavated material. Open cuts are normally used in low flow or intermittent flow situations, and are completed quickly. Impacts to surface waters as a result of the open cut method may be increased sediment transport which has the potential to harm fish and other organisms; physical changes to the banks of streams and rivers and alterations of substrates, including vegetation all of which may alter stream geomorphology.
- **Guided bores and horizontal directional drilling** – These two methods for crossing surface waters require drilling a tunnel beneath a water body from an upland location on one side of the water body to the other. Then, the pipe is pushed through the tunnel. Guided bores are typically shallower in depth than horizontal directional drilling operations, but both are dependent on site conditions such as soil types.
- Horizontal directional drilling requires drilling mud, which is typically bentonite clay or a mixture of bentonite clay with a variety of chemical additives. The mud is used to lubricate the drill as it bores through the earth. The chemical additives in drilling mud can reduce the likelihood of a frac-out during a drilling operation. A frac-out is a surface release of drilling mud through fractured bedrock or sand. When drilling mud is released in aquatic systems, it has adverse impacts on fish and aquatic organisms, such as altering pH and changing the substrate especially in rivers and streams. When frac-outs occur in rivers or streams, the drilling mud can be carried downstream increasing the affected area. Frac-outs do not always show up on the surface immediately during a drilling operation, rather they have been observed days after a drilling operation takes place and often dozens of feet from the location of the pipeline.

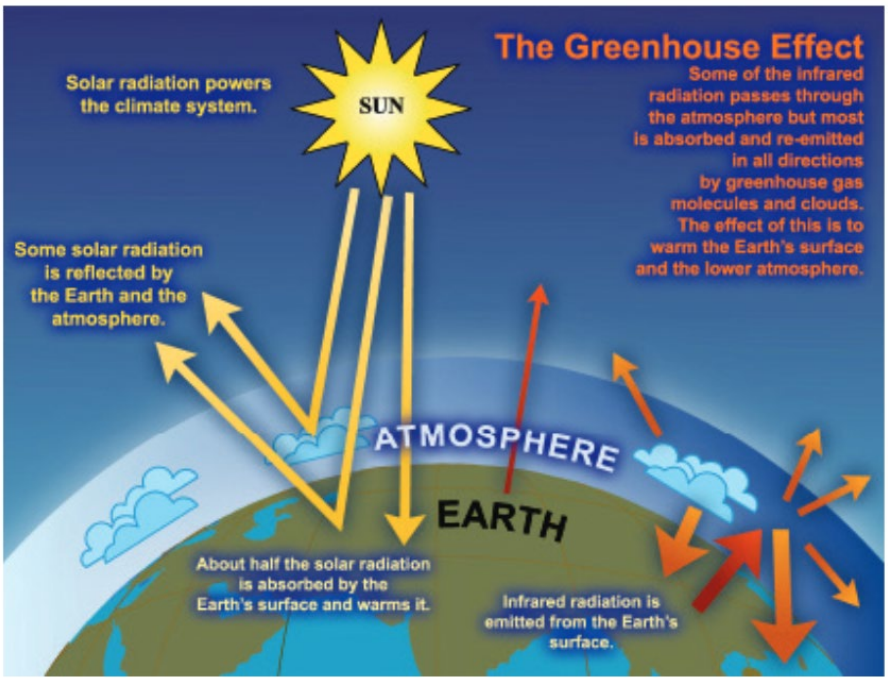
Climate change – environmental impacts

Development of infrastructure to support the extraction, transportation, refinement, and combustion of oil has the potential to release additional carbon into the atmosphere and may perpetuate a carbon-based

economic structure that contributes to climate change. [103] Minnesota has a state goal to reduce greenhouse gas emissions 80% below 2005 levels by 2050, building infrastructure for fossil fuels and making capital investments in this infrastructure should take this goal into account.

Burning fossil fuels such as oil, coal and natural gas, produces carbon dioxide, the most predominant greenhouse gas (GHG). GHG emissions, contributing to the greenhouse effect seen in Figure 12, need to be brought under control, particularly in the next 15 years, to forestall the worst effects of climate change. In Minnesota, there have been three 1,000-year floods since 2004 and dozens of intense weather events – from hailstorms to tornadoes to droughts. [104] Climate experts project that extreme weather events such as these will occur more frequently as a result of climate change. Moreover, predictions of extreme heat, poor air and water quality and sweeping changes to Minnesota's wildlife and fish habitats foreshadow significant changes. [105]

Figure 12: The greenhouse effect[106]



Air pollutant emission inventory

While transporting oil through pipelines is considered to have negligible emissions of pollutants by the Environmental Protection Agency, the ultimate use of that oil contributes significant air pollution, including greenhouse gases that contribute to climate change. Air pollutant emissions in Minnesota are

[103] The White House; U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation (November 2014); retrieved on November 17, 2014 from www.whitehouse.gov/the-press-office/2014/11/11/fact-sheet-us-china-joint-announcement-climate-change-and-clean-energy-c
[104] Minnesota and Climate Change: Our Tomorrow Starts Today. Minnesota Environmental Quality Board. 2014.
[105] Ibid.
[106] Oil Sand and the Keystone XL Pipeline: Background and Selected Environmental Issues. Congressional Research Service. February 2013.

inventoried by the Minnesota Pollution Control Agency[107] and used to determine the type and quantity of pollutants being emitted into the atmosphere. The data are then used to calculate an emissions fee for each facility. Pipelines are not included in this inventory as they are not considered to have significant emissions. Emissions do occur in Minnesota at refineries as the refining of oil is energy intensive. The increased volume of Canadian oil sands crude oil has made refining more energy intensive, leading to higher greenhouse gas emissions associated with production.

While most emissions from crude oil production and transportation do not occur in Minnesota, Minnesota plays a role in the approval of the development of infrastructure to support the extraction, refinement, and combustion of oil, gas, and coal reserves in neighboring states and Canada.

The 2013 U.S. Environmental Protection Agency Inventory of U.S. Greenhouse Gas Emissions and Sinks found that transportation accounts for about 0.4% of oil industry emissions and refining accounts for about 1.3%. Within transportation of crude oil, the majority come from loading operations and the rest from venting and fugitive emission. It was beyond the scope of this report to compare the emissions associated with alternative modes of oil transportation. Further study could be done to look at emissions associated with transportation of crude oil by way of rail versus pipeline versus truck.

Life cycle emissions

Different crude oils have different greenhouse gas intensities based upon their properties, method of extraction, and refinery process. Life-cycle assessment is an analytic method used for evaluating and comparing the environmental impacts of various products (in this case, the climate change implications of hydrocarbon resources). Life-cycle assessments can be used to identify, quantify, and track emissions of carbon dioxide and other greenhouse gas emissions arising from the development of hydrocarbon resources, and to express them in a single, universal metric of carbon dioxide equivalent (CO_2e) greenhouse gas emissions per unit of fuel or fuel use. Such comparisons allow for evaluation of the greenhouse gas emissions intensity of various stages of the fuel's life cycle, as well as to compare the emissions intensity of one type of fuel or method of production to another.

The Congressional Research Service conducted[108] a life-cycle assessment that showed Canadian oil sands crudes are generally more greenhouse gas emission-intensive than other crudes and emit an estimated 17% more GHGs on a life-cycle basis than the average barrel of crude oil. A life cycle emissions analysis could be done for proposed projects in Minnesota.[109]

[107] More information is available at: http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-modeling/emissions-overview.html
[108] Lattanzio, Richard; Congressional Research Service; Canadian Oil Sands: Life-Cycle Assessments of Greenhouse Gases. March 2014. Retrieved from http://fas.org/sgp/crs/misc/R42537.pdf
[109] US Department of State; Keystone XL Final SEIS. January 2014. Retrieved from http://keystonepipeline-xl.state.gov/finalseis/index.htm

Potential human health impacts

Pipelines have the potential to impact the health of Minnesotans in many ways, both positive and negative. They have the potential to contaminate groundwater and drinking water in the event of spills or leaks, to impact community resources (housing, infrastructure) and cohesion. However, they may also provide employment which can have positive impacts on health by providing resources to purchase health care and nutritious foods.

Environmental justice and health equity

A statewide assessment, "Advancing Health Equity in Minnesota", [110] has found that not all Minnesotans have the same chances to be healthy. Some Minnesota citizens are not as healthy as they could be and the health disparities that exist are significant, persistent, and cannot be explained by bio-genetic factors. Those with less money and populations of color (especially American Indians) consistently have less opportunity for health and experience worse health outcomes.

Everyone should have the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, play, and work. No group of people should bear a disproportionate share of negative environmental impacts, and all people should have an opportunity to inform and affect the decision-making process. These are important principles of environmental justice and important considerations for the transportation of crude and refined oil products through Minnesota.

The transportation of crude and refined oil products within and through the state, and the refining and storage of these products in Minnesota have the potential to have a greater negative health and quality of life impacts on lower income Minnesotans and residents of color. For example:

- **Vehicle and rail transportation –** Areas around high volume traffic and rail corridors, especially in urban areas, are often populated with higher concentrations of low-income and minority groups than found in other areas. Consequently, these groups are exposed to greater amounts of air and noise pollution from transportation sources. Recent increases in crude oil rail shipments exacerbate these significant concerns as well as risks from potential spills.
- **Refining and storage –** Areas surrounding large industrial facilities such as refineries and storage terminals are often inhabited by lower-income residents. Releases to air, water, and land may disproportionately affect nearby residents.
- **Pipeline transportation –** Leaks in petroleum pipelines have significant potential to directly affect human health and safety, and lead to surface and groundwater pollution. If on or near tribal lands, this can affect tribal members or resources of importance to tribal members.

When considering pipeline projects within the state, the potential for impacts to minority and low-income populations should be assessed and described. For example, the Keystone XL environmental impact statement identified impacts to minority and low-income populations within a 4 mile corridor as well as 10 miles down rivers and creeks that would be crossed by the pipeline.

Social determinants of health

The social determinants of health are the conditions in which people are born, grow, live, work, and age and are mostly responsible for our personal health. They also contribute to health inequities – the unfair

[110] MDH, Advancing Health Equity in Minnesota (February 2014); retrieved from www.health.state.mn.us/divs/chs/healthequity/ahe_leg_report_020414.pdf

and avoidable differences in health status seen within and between communities. Life expectancy, maternal and child health, violence, oral health, suicide rates, and substance dependence are health outcomes commonly used as general indicators of physical and social wellness. Family structure, economic status, educational attainment, family stability, and cultural continuity are health determinants that are associated with positive and negative health outcomes.

When a pipeline project is proposed in the state, available data[111] can be used to identify areas of vulnerability and areas of resilience within communities. If areas of vulnerability are identified that could be exacerbated by a project, these areas may require monitoring to ensure that the project does not make conditions worse. Alternatively, a project could provide a beneficial component to community. This analysis could be completed during environmental review or could be completed as part of a Health Impact Assessment. For example, a pipeline might have the potential to disrupt subsistence activities of a native population. Alternatively, increased household income from employment provides opportunities to purchase nutritious foods such as fresh fruits and vegetables. The magnitude of the impact should also be described, i.e. a temporary increase in household income from a short-term construction job.

Exposure to potentially hazardous materials

Drinking water contamination

Contamination is a serious risk, should a pipeline spill, leak, or rupture occur. Pipelines sited within Drinking Water Supply Management Areas (DWSMAs) must adhere to the requirements of the wellhead protection plan approved for each public water supplier to ensure that groundwater contamination does not occur and that drinking water is not impacted by pipeline leaks or spills. Each plan may have different requirements depending on the geologic conditions of that area. Not all public water supplies have a DWSMA established; however, for many of these suppliers a preliminary assessment called a source water assessment is available. A source water assessment can still provide useful information to assist a public water supplier in protecting drinking water sources from groundwater contamination. More information about source water assessments can be found at:
http://www.health.state.mn.us/divs/eh/water/swp/swa/

Development of pipelines within or in the vicinity of public drinking water sources, whether surface water intakes or groundwater wells, results in the potential for contamination of that supply if a leak occurs. Approximately 400 of 554 DWSMAs statewide are within 2 miles (4 mile total buffer) or less of a crude oil pipeline.[112] Current monitoring of public water systems is typically on a scheduled, but infrequent basis for compliant water systems. As such, typical monitoring might not be sufficient to detect contamination in drinking water that could result from leaking pipelines**.** Pipelines constructed in or near drinking water supplies could include a monitoring plan with monitoring frequencies that would detect contamination in drinking water supplies so that exposure to those drinking the water would be minimized.[114] Private domestic drinking water wells can also be affected by oil pipeline leaks or spills. While many pipelines in operation are equipped with leak detections systems, a contingency monitoring plan to detect contamination to nearby private domestic drinking water wells could also be put in place.

[111] https://apps.health.state.mn.us/mndata/
[112] DWSMA boundaries may change and new crude oil pipelines may be constructed, therefore this number is subject to change and is only accurate as of December 2014.

Air quality

In addition to drinking water impacts, there is potential for air quality impacts in the event of a spill, leak, or explosion. Air quality contaminants of concern include volatile organic compounds and hydrogen sulfide. Of these, benzene, a human carcinogen, presents the biggest potential health concern.[113] The risk of health effects from inhaling any chemical depends on how much is in the air, and how long and how often a person breathes it in. Scientists look at short-term exposures as hours to days or long-term exposures as years to even a lifetime. The Minnesota Department of Health has developed both a chronic (less than 5 µg/m3) and acute (1,000 µg/m3) health risk value for benzene in ambient air. The department's assessment indicates a potential for developmental and reproductive health concerns from short-term exposures of 1,000 µg/m3.

In July 2010, after an oil spill in Michigan's Kalamazoo River and Talmadge Creek, benzene was measured in air samples at concentrations of up to 10,000 ppb or about 32,000 µg/m3.[114] that was 32 times higher than MDH's acute value of 1,000 µg/m3ppb.[114] In addition, these levels were measured three days following the spill and therefore levels immediately following the spill can be assumed to have been even higher. People living in areas with these elevated concentrations were recommended to evacuate and temporary health effects (primarily headaches, nausea, respiratory discomfort, and eye irritation) were reported up to over three weeks following the spill.[115]

Volatile Organic Compounds (VOCs) evaporating from polluted soil and groundwater rise towards the ground surface. These vapors may enter homes through cracks in the foundation, around pipes, or through a sump or drain system. In this way, the VOC vapors enter buildings and contaminate indoor air. This process, when pollution moves from air spaces in soil to indoor air, is called vapor intrusion.[116.] The potential for impacts related to vapor intrusion from crude oil that remains in soil after a leak or spill are currently unknown; further research is needed. In addition, health care provider training in conjunction with other emergency and spill response training and planning was identified as a future preventative measure.

Health and public services infrastructure and capacity

When assessing the impacts of a project, the project proposer should identify medical facilities in the vicinity of the project. These facilities have been identified for other pipeline projects as locations that could provide emergency medical care and, in some cases, serve as the base for local emergency medical response and transport services for accidents that might occur during project construction or operation. Police and fire departments should be identified and assessed for capacity to respond during emergency situations. Furthermore, in Minnesota communities that are bifurcated by railroad tracks, there is potential for decreased emergency response time due to increased rail traffic. This should be factored into the emergency response capabilities of these areas.

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[113] Michigan Department of Health; Public Health Assessment, Evaluation of Air Contamination; August 2014; retrieved from www.michigan.gov/documents/mdch/Enbridge_Oil_Spill_Air__PHA_-_PC_08-26-2014_466005_7.pdf

[114] Ibid.

[115] MDH Emergency Response Guidance for Community PWSs (August 2010); retrieved November 17, 2014 from www.health.state.mn.us/divs/eh/water/factsheet/emergency/response.pdf

[116] MDH Vapor Intrusion; retrieved December 8, 2014 from www.health.state.mn.us/divs/eh/hazardous/topics/vaporintrusion.html

Health Professional Shortage Areas (HPSAs) and Medically Underserved Areas/Populations (MUAs/MUPs)[117] should also be identified. HPSAs may be designated as having a shortage of primary medical care, dental, or mental health providers. They may be urban or rural areas, population groups, or medical or other public facilities. MUAs may be a whole county or a group of contiguous counties, a group of county or civil divisions, or a group of urban census tracts in which residents have a shortage of personal health services. MUPs may include groups of persons who face economic, cultural or linguistic barriers to health care. These areas and populations are already vulnerable based on this designation and an influx of workers or environmental health impacts from spills or leaks could exacerbate this vulnerability. As of 2011, there were six hospitals and 145 other facilities that would require specialty evacuation in the event of an emergency within 2 miles (4 mile total buffer) or less of a crude oil pipeline.

Workforce influx

Without adequate planning, construction projects that require a large workforce can have impacts to the public health and welfare of communities. While communities can benefit economically from an increased workforce (as discussed in the economics section of this Report), the sudden influx of short or long-term workers (primarily during construction) into local communities can generate demands on local housing stock and public services such as emergency response, medical, police, and fire protection services. These increased demands can potentially overwhelm the ability of a small community to provide adequate public services which could have negative impacts on public health. The extent of impacts would depend upon the composition of the workforce in terms of local versus non-local workers, the size of the existing population of the area and the size and duration of the construction project. While these types of workforce influx issues have not been typical of pipeline projects in Minnesota, considering the potential impact that increased workforce can cause is a good practice for any type of project which requires transient workers in order to ensure minimal negative impacts on communities.

A larger, long-term duration project in a small, rural community, in which mostly non-local workers are employed, has the greatest potential for workforce influx related impacts to the health and welfare of a community because a smaller community's infrastructure may be unable to handle sudden increases in population. In extreme cases, such as North Dakota where there has been a tremendous surge in non-local long-term workforce at oil fields, issues such as food shortages increases in crime, and increased automobile accidents among others have been seen.[118] [119] Workforce influx can certainly have positive impacts for a community, but the potential negative impacts are often overlooked and can lead to harmful effects on public health.

In order for local units of government and the communities along the route to assess potential impacts from worker influx, the anticipated number of workers should be described for each pipeline segment of a project as well as the length of construction time at each segment. Additionally, whether segment construction would occur simultaneously or in phases should be clarified. Because of the specialized nature of pipeline construction, employment opportunities for area residents may be limited depending on skill set of the local workforce. While negative impacts from workforce influx has not been typical of oil pipeline construction projects in Minnesota, an awareness of potential problems and how to mitigate them

[117] Health Professional Shortage Areas (HPSAs) & Medically Underserved Areas/Populations (MUAs/MUPs); retrieved from www.hrsa.gov/shortage/
[118] Ellis, Blake; CNN Money (October 2011); Six Figure salaries, but homeless; retrieved from http://money.cnn.com/2011/10/21/pf/america_boomtown_housing/index.htm?iid=EL
[119] Sheerin, Jude and Anna Bressanin; BBC News (March 2014); North Dakota oil boom: American Dream on Ice; retrieved from http://www.bbc.com/news/magazine-25983917

if encountered, is representative of a careful and thoughtful planning process. Concern for potential influx issues applies to any and all projects (not just pipelines) which employ a transient workforce.

Climate change - human health impacts

Weather and climate play a significant role in people's health. Changes occurring in Minnesota's climate are already affecting our health and wellbeing and will have even greater impacts in the future. Warmer average temperatures lead to hotter days and more frequent and longer heat waves which can increase the number of heat-related illnesses and deaths. Warmer temperatures can increase the concentrations of unhealthy air and water pollutants. Increases in the frequency or severity of extreme weather events can increase the risk of flooding, high winds, and other direct threats to people and property. Changes in temperature, precipitation patterns, and extreme events can increase the spread of some diseases. The Minnesota Department of Health's Climate and Health Program[120] is helping to understand health impacts and prepare local public health and the public for the health risks from changes in Minnesota's climate. Whether oil transported in pipelines through Minnesota is burned in Minnesota or elsewhere in the globe, the greenhouse gas contribution from combustion will contribute to climate change.

[120] MDH Minn. Climate and Health Program; retrieved from www.health.state.mn.us/divs/climatechange/

Findings and considerations

Potential environmental and health impacts are project-specific. The information discussed in this chapter attempted to create a high-level overview of possible impacts that could occur, given the variability of possible pipeline routing sites throughout the State.

Environmental impacts

Vegetation and wildlife

- Pipeline construction and ongoing maintenance has the potential to directly and indirectly affect key Conservation Focus Areas and the species that use them. [121] While the avoiding all key focus areas is not realistic, minimizing the fragmentation and disturbance of these key areas to the extent practicable should be considered. Minnesota recently completed a State Wildlife Action Plan[122] identifies conservation needs, actions, and priorities for species of concern, including threatened and endangered wildlife and other important wildlife species. The results of the species analysis indicated that habitat loss and degradation are the most significant challenges facing Minnesota's rare species. This information can provide a basis for identifying Conservation Focus Areas that should be avoided for pipeline routing.
- Direct habitat loss, habitat degradation, and fragmentation can occur when locating pipelines across large blocks of habitat and habitat complexes. To the extent feasible, avoiding the fragmentation of large contiguous blocks of habitat of 40 or more acres can help minimize wildlife impacts.

Surface water

- When constructing large linear projects, crossings of public waters will likely be unavoidable. However, minimizing the number and/or length of crossings is possible. The DNR recommends avoiding and minimizing crossings. Where crossings are needed, winter construction is preferred to minimize wetland impacts due to construction. This is especially important in sensitive and difficult to restore wetlands such as bogs and fens.
- To mitigate adverse effects to surface waters, crossing techniques should minimize vehicle contact with surface waters and equipment should be cleaned to prevent transportation of aquatic invasive animals and plants. Other considerations include minimizing grading and disturbance to waterbody banks and crossings be timed to avoid sensitive spawning periods, such that resulting steam bed disturbance and sediment impacts would be temporary and minimized. The Minnesota Department of Natural Resources utility licenses to cross public waters may require specific crossing methods to reduce the potential for adverse impacts.
- Due to the sensitive nature of areas such as trout streams, these areas should be avoided when practical. In addition, during permitting, assessing the feasibility of incorporating shut-off valves

[121] Subsection profiles (which includes conservation actions and priorities) are available at: http://www.dnr.state.mn.us/ecs/index.html

[122] Minnesota's SWAP is available online at: http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/chapters_appendix/tomorrows_habitat_toc.pdf. Minnesota's SWAP, "Tomorrow's Habitat for the Wild and Rare", describes conservation concerns for species whose populations are rare, declining or vulnerable to decline and are below levels desirable to ensure long-term health and stability and their key habitats within various landscape settings. The DNR and the U.S. Forest Service developed ecological mapping and landscape classification following the National Hierarchical Framework of Ecological Units (Ecomap 1993).

in close proximity to trout stream crossings to minimize impacts in the event of a failure is advised.

Climate change

- Whether oil transported in pipelines through Minnesota is burned in Minnesota or elsewhere on the globe, the greenhouse gas contribution from this combustion will further contribute to climate change. While most emissions from crude oil production and transportation do not occur in Minnesota, Minnesota plays a role in the approval of the development of infrastructure to support the extraction, refinement, and combustion of oil, gas, and coal reserves in neighboring states and Canada.

Human health impacts

Overall, human health is complex and can be affected negatively and positively through direct and indirect factors. Health is not only affected by contamination of air or water, but by the availability of healthy food and access to care. Pipeline projects, as with many other types of projects, have the ability to affect many of the different factors that contribute to overall health of an individual and to the overall health of a community. Through proper planning, these potential issues can be identified and mitigated, as needed.

Environmental justice

- The potential for impacts to minority and low-income populations should be assessed and described. The transportation of crude and refined oil products within and through the state, and the refining and storage of these products in Minnesota have the potential to have a greater negative health and quality of life impacts on lower income Minnesotans and residents of color. For the Keystone XL pipeline potential impacts to minority and low-income populations were identified within a 4 mile corridor as well as 10 miles down rivers and creeks that would be crossed by the pipeline.
- Project proposers in Minnesota can achieve this type of analysis by reviewing census data, [123] American Community Survey data, [124] and data available on Minnesota Department of Health's Minnesota Public Health Data Access Portal. [125] If populations are identified, and there is potential for disproportionate impacts, mitigation should be developed to minimize these impacts. Projects that would impact tribal lands and communities should also specifically engage tribal communities in comprehensive consultation.

Exposure to potentially hazardous materials

- Pipeline spills and leaks can impact air and water quality and be hazardous to human health.
- Approximately 400 of 554 Drinking Water Supply Management Areas (DWSMAs) in Minnesota are within 2 miles (4 mile total buffer) or less of a crude oil pipeline.
- The project proposer, when assessing the impacts of a project, should identify medical facilities in the vicinity of the project that could provide emergency medical care and serve as the base for local emergency medical response and transport services. Health Professional Shortage Areas and Medically Underserved Areas near pipeline routes should be identified. This identification is valuable because these areas and populations are already vulnerable based on their designations and an influx of workers or environmental health impacts from spills or leaks could exacerbate

[123] www.census.gov/data/data-tools.html
[124] www.census.gov/acs/www/
[125] https://apps.health.state.mn.us/mndata/

this vulnerability. As of 2011, there were six hospitals and 145 other facilities that would require specialty evacuation in the event of an emergency within 2 miles (4 mile total buffer) or less of a crude oil pipeline.

Summary of public comments

During public review of this report, some potential environmental and human health-related comments received expressed the following:

- More information requested for potential environmental impacts from abandoned pipelines.
- More information requested on impacts from other modes of oil transport.
- Should include reference to impacts from pipeline spills.
- More information requested on life-cycle impacts for extraction, transportation and combustion of crude oil.
- More information requested for impact of mitigation options.
- More information requested for potential human health impacts from water contamination.
- More information requested on potential social problems associated with oil production.
- Concern that climate change should not be included in the discussion of how crude oil is transported.
- Disagree that the greatest threat to habitat is during construction.

More study needed

Environmental and human health-related issues identified for more study include:

- Understanding short-term potential environmental risks of leaving an abandoned pipeline in the ground; possible cumulative impacts (obstruction of groundwater flow, hydrological changes, chemical changes to soil with deterioration of pipe)
- Review and discussion of long-term legacy issues related to de-commissioned pipes left in the ground in perpetuity
- Study of life-cycle impacts to enhance understanding of effects and potential mitigation options
- Study of impacts from all potential modes of transport for crude oil to identify best options forward for Minnesota; as crude oil passes through the State
- Better understanding of potential environmental impacts of mitigation options

Pipeline review process

This section outlines the procedures and approvals necessary for oil pipeline construction and operation in Minnesota.

Certificate of Need

The Certificate of Need (CN) process, administered by the Public Utilities Commission (Commission), is designed to evaluate whether there is need for a large energy facility in Minnesota and the region; and whether the size, type and timing of the proposed project can best meet that need The need analysis is meant to determine whether the proposal will meet an identified need consistent with various Minnesota policies, including reliability, reasonable costs, and environmental protection.[126]

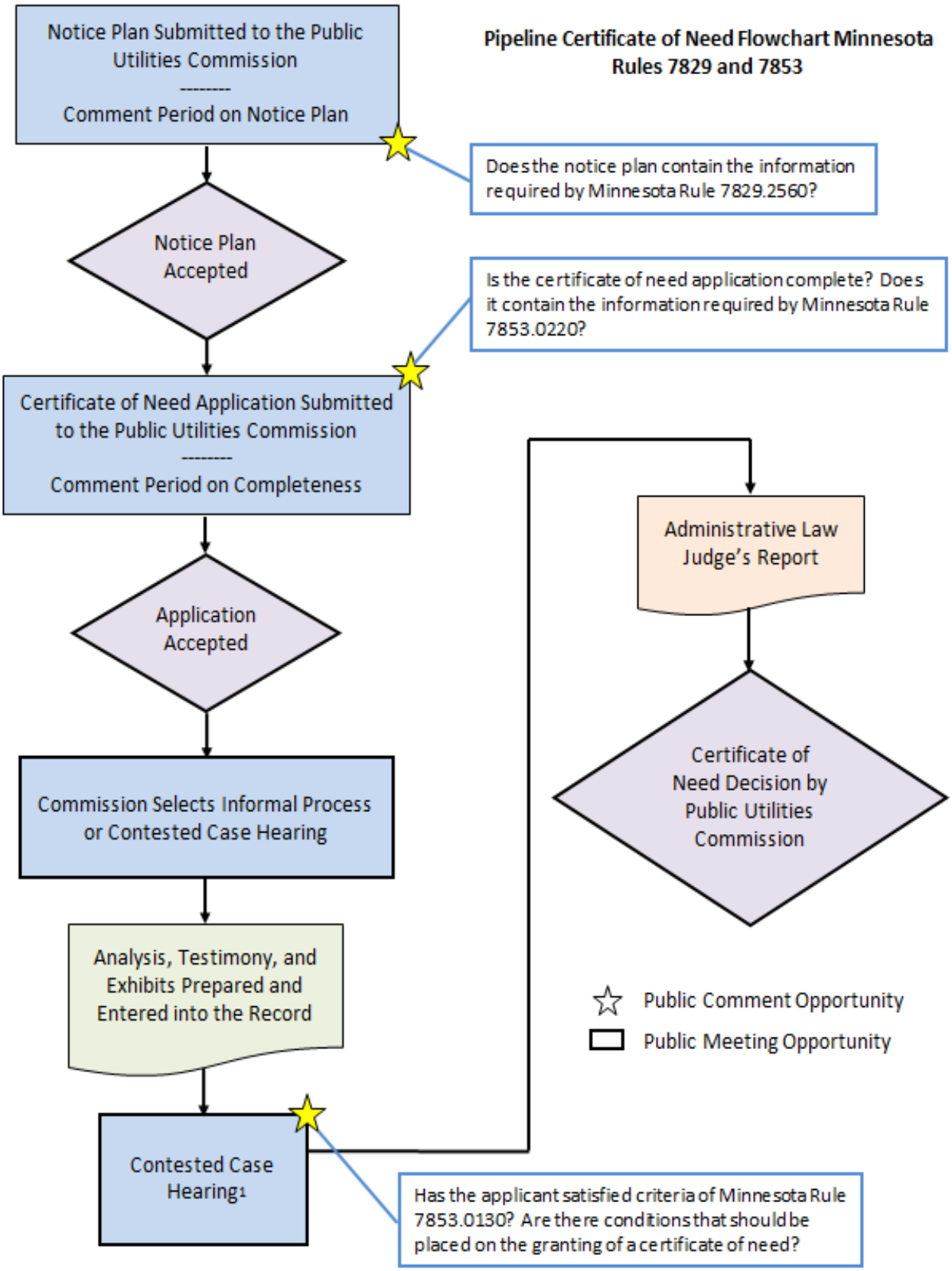
This analysis is described in greater detail in this section. Ultimately, in the need process, the Commission determines the types of facility the size of the facility and when the facility must be in service. Minnesota Statute section 216B.243 requires that the Commission make a decision within 12-months; from the date that the Commission determines that the application is complete. Its role as public advocate in Commission proceedings, the Division of Energy Resources of the Minnesota Department of Commerce (Commerce-DER) Energy Regulation and Planning provides an evaluation of all petroleum projects requiring a CN, according to Minnesota statutes and rules. [127]

The Energy Environmental Review and Analysis (Commerce-EERA) unit within the Department of commerce conducts any environmental analysis requested by the Commission for pipeline projects requiring a CN. The Commission has requested environmental analysis from Commerce-EERA for recent pipeline CN applications. Minnesota law[128] prohibits siting or construction of a large energy facility without a CN by the Commission. New large petroleum pipeline facilities and any project that, within a period of two years, would expand an existing large petroleum pipeline[129] in excess of either 20% of its rated capacity or 10,000 barrels per day, whichever is greater, require a CN. The construction or expansions of petroleum refineries do not require a CN.

The CN process includes the notice plan, an application completeness review, an environmental analysis, building the record, and a Commission decision (Figure 13).

[126] Minn. Rules 7853.0130
[127] Minn. Stat. 216B.2421 and Minnesota Rules Chapters 7851 and 7853
[128] Minn. Stat. 216B.243, subd. 2
[129] Minn. Rules 7853.0030 identifies that large energy facilities require a CN; Minn. Rules 7853.0010 defines a large petroleum pipeline in Minnesota as a pipeline greater than six inches in diameter and having more than 50 miles of its length in the state used to transport crude petroleum or petroleum fuels or oil or their derivatives.

Figure 13: Pipeline certificate of need flowchart



[1] If a contested case hearing has been selected by the Commission.

Notice plan

Minnesota rules require an applicant for a pipeline Certificate of Need to file a notice plan proposal with the Commission at least three months before filing the application. [130] The Commission reviews the notice plan to ensure that all required information about public notices is included and is correct. Commerce-DER makes recommendations for additions or clarifications to enhance public understanding and awareness of project scope and design, Commerce-DER submits comments to the Commission under the timelines of the notice review process. The Commission uses this and other information to decide whether to approve, approve as modified, or deny the notice plan.

Application completeness

Once the CN application has been filed with the Commission, the Commission typically issues a notice of comment period on completeness of the application. The Commission, through the public comment period, requests agencies and the public to comment on the completeness of a CN application. Members of the public, government agencies, and other interested parties may submit comments.

Minnesota Rule 7853.0220 identifies the data and information required in a CN application. Commerce-DER files comments with the Commission recommending that the application be accepted as complete or identifying shortcomings in the application. The applicant is then given the opportunity to supplement the application with additional data, clarify where the data in question can be located in their initial filing or state their disagreement with Commerce-DER's comments. The Commission uses Commerce-DER's comments, other agency and public comments received, and other relevant information in making the determination. Once the Commission determines that the application is complete, the 12-month CN process officially begins.

Environmental analysis

In determining whether a Certificate of Need should be granted, consideration must be paid to the "natural and socioeconomic environments compared to the effects of reasonable alternatives," [131] and "the effect of the proposed facility, or a suitable modification of it, upon the natural and socioeconomic environments compared to the effect of not building the facility." [132] Consequently, an applicant for a CN must submit to the Commission, in its CN application, information on the potential environmental impacts of a proposed pipeline. Information and analysis on potential environmental impacts is also provided by parties and entered into the record as testimony and exhibits. Citizens and agencies that are not official parties to the proceedings can also submit environmental impact information into the record through public hearings or through the public comment process (discussed below).[133] The Commission has discretion to request environmental analysis as part of the proceedings. [134] Any analysis requested by the Commission is entered into the record as an exhibit. Citizens, agencies, and the Commission can use the information in analyzing an application.

[130] Minn. Rule 7829.2560
[131] Minn. Rule 7853.0130.B.3
[132] Minn. Rule 7853.0130.C.2
[133] Minn. Rule 7853 does not call for the preparation of a separate environmental analysis document as part of CN proceedings.
[134] Minn. Stat. 116D.03.

Building the record

The Commission has two options for evaluating an application. In deciding which process to use, the Commission typically requests comments from the public and parties including Commerce-DER indicating whether it appears that informal or contested case proceedings would be appropriate for evaluating a Certificate of Need application. [135]

Informal proceedings

The first option for evaluating a Certificate of Need is through an informal public comment process that typically uses an administrative law judge (ALJ) to preside at the public hearing and to provide a summary of public comments received. The comment process allows Commerce-DER, the applicant, state agencies and members of the public to submit comments until the end of the public review period on the application for consideration by the Commission once the final comment period closes. The proceeding also includes at least one public hearing to solicit public input; all of which is added to the record. The Commission generally uses this process when no material facts are in dispute, all parties and the Commission have agreed to informal proceedings, or when informal or expedited proceedings are required by statute. In informal proceedings, facts are generally submitted into the record via written comments.

Contested case proceedings

The second option for evaluating a Certificate of Need application is through a contested case proceeding. This proceeding is moderated by an ALJ, assigned through the Office of Administrative Hearings (OAH). Once the case has been referred to this office, the judge assigned will issue an order with a deadline to apply for intervention (party status), and with a schedule that includes dates for applicant and intervener testimonies to be filed and sets the public comment period. In such proceedings, facts are submitted into the record through several rounds of written testimony and from witnesses at an evidentiary hearing conducted by the ALJ. The judge also conducts public hearings to solicit public input, all of which is added to the record. Based on all of the information in the record, the judge then drafts a report entitled a Findings of Fact, Conclusions of Law and Recommendation (ALJ Report) The Commission subsequently decides on the matter.

Evaluating the Certificate of Need application

Regardless of whether an application is evaluated under informal or contested case proceedings, the Commission evaluates an application for a Certificate of Need for a pipeline in Minnesota by assessing the following, in accordance with Minnesota statutes and rules:

[135]The Commission often issues a joint request for comments on completeness and for comments on whether an application should be evaluated informally or through a contested case.

Criteria used by the Commission and evaluated by Commerce-DER for a pipeline Certificate of Need[136]

Under Minnesota Statute 216B.243, Subd. 3, the Commission must evaluate the following in assessing need:

- The accuracy of the long-range energy demand forecasts on which the necessity for the facility is based;
- The effect of existing or possible energy conservation programs on long term energy demand;
- The relationship of the proposed facility to overall state energy needs;
- Promotional activities that may have given rise to the demand for this facility;
- Benefits of this facility, including its uses to protect or enhance environmental quality, and to increase reliability of energy supply in Minnesota and the region;
- Possible alternatives for satisfying the energy demand, including but not limited to potential for increased efficiency;
- The policies, rules, and regulations of other state and federal agencies and local governments; and
- Any feasible combination of energy conservation improvements that can (i) replace part or all of the energy to be provided by the proposed facility, and (ii) compete with it economically; and,

Pursuant to Subd. 1 of Minnesota Statute 216B.243, the commission has adopted additional criteria for the assessment of need, which are listed under Minnesota Rules 7853.0130:

- The probable result of denial would adversely affect the future adequacy, reliability, or efficiency of energy supply to the applicant, their customers, or the people of Minnesota and neighboring states;
- A more reasonable and prudent alternative to the facility has not been demonstrated by evidence in the record;
- The consequences to society of granting the Certificate of Need are more favorable than the consequences of denial; and
- It has not been demonstrated in the record that the design, construction, or operation of the proposed facility will fail to comply with those relevant policies, rules, and regulations of other state and federal agencies and local governments.

An applicant is required to address all of these criteria and provide corroborating data or information in their application to support their assertions. [137] In its role in the CN process, Commerce-DER evaluates the information provided by the applicant and supplements it by requesting additional or more specific data. Commerce-DER often performs research to locate reliable, corroborating sources for claims made by the applicant. For example, an applicant may make claims regarding supply or demand of crude oil in a specific region, but be unable to provide data sufficient for forecast replication. In that case, Commerce-DER would attempt to compare the applicant's forecast to forecasts from reputable sources such as the Energy Information Agency (EIA) or Canada's National Energy Board. These comparisons allow Commerce-DER to assess whether the statements and conclusions made in the application are supported and reasonable.

Commerce-DER may also perform its own economic analysis, such as analyses of data provided by the applicant or mined from publicly available sources such as EIA databases. For crude oil pipelines, this type of analysis is typically performed to gain contextual understanding for the impact that a proposed project in Minnesota may have on regional petroleum markets.

[136] Minn. Stat. 216B.243, Minn. Rule 7853.0130
[137] Minn. Rule 7853.0220.

Commission decision

The Commission considers information in the CN application; public comments, testimony, briefs and exceptions received in the matter; the ALJ Report; and other evidence in the record when making its decision on whether to grant a CN. Commerce-DER staff and other parties attend the meeting, provide oral arguments, and are available to answer any questions that commissioners may have during their deliberations. At the conclusion of deliberations, the commissioners vote on whether to issue an order approving, approving as modified, or denying the application for a Certificate of Need.

Once the Commission's order has been issued, Commerce-DER involvement in the petroleum pipeline process is largely concluded, with the exception of monitoring applicable regulatory filings for compliance with the Commission's order.

Federal approval

The rates and terms of service of oil pipelines are regulated by the Federal Energy Regulatory Commission (FERC) as common carriers under the Interstate Commerce Act. FERC has "exclusive jurisdiction to determine whether a pipeline's rates and terms of service are just, reasonable, and not unduly discriminatory." FERC requires oil pipeline companies to publish tariffs, and collects information from them as necessary for its ratemaking responsibilities. FERC does not determine whether an oil pipeline is needed, nor does it regulate the routing, construction, or expansion of oil pipelines.

States may regulate the routing, construction, and expansion of oil pipelines and may have a variety of approvals, permits, and licenses to effect this regulation.

Subsequent modifications to Certificate of Needs

If the project is not in service within two years of the certified date, the project owner must request recertification of the project. However, the project owner could add or subtract up to 10% of the capacity or length of the project without recertification by the Commission. [138]

Evolution and improvement of the Certificate of Need process

The Commission, through several recent orders, has established various requirements, conditions, or procedures that have refined the CN process on a case by case basis. These include:

- A recent preference for evaluating all pipeline CNs, even upgrade projects, through the more thorough contested case procedure.
- Requiring analysis of potential human health and environmental impacts of pipeline projects, with such analysis being entered into the record.

[138] Minn. Rule 7853.0800, subp. 2.

Pipeline route permit

A pipeline route permit from the Commission is required for the construction of pipelines with a diameter of six inches or more that are designed to transport hazardous liquids, and those that are designed to carry natural gas and be operated at a pressure of more than 275 pounds per square inch. [139] Hazardous liquids are defined by federal regulation and include crude oil, refined petroleum products, highly volatile liquids (propane, butane), carbon dioxide, and anhydrous ammonia.

Pipeline route permit proceedings are governed by Minnesota Rules Chapter 7852. Applicants for a pipeline are required to submit to the Commission a route permit application, including an analysis of the potential human and environmental impacts that may be expected due to the project. [140] The Commission initiates a comment period and solicits comments on the completeness of the route permit application. In its application, the applicant must identify its preferred route for the project and discuss all other route alternatives considered by the applicant. [141] Applicants for a pipeline route permit can apply to have their application reviewed under the partial exemption process or the full review process. [142] The partial exemption process is intended for projects that are not anticipated to have a significant impact on humans or the environment. [143] The full review process is intended for projects that may have a significant impact on humans or the environment. Commerce-EERA file comments with the Commission including recommendations concerning the application. The Commission has 90 days after application acceptance to make a route permit decision under the partial exemption process. [144] The Commission has nine months to make a route permit decision under the full review process, unless the Commission extends this deadline for cause. [145]

Partial exemption process

For the partial exemption process, when the application is complete, Commission and Commerce-EERA staff conduct public information meetings in each county the pipeline crosses. The Commission initiates a comment period and solicits comments on the potential impacts of the pipeline project and whether to issue a pipeline route permit through the partial exemption process. If the Commission determines that the project will not have a significant impact on humans or the environment, the Commission may issue a route permit for the project. [146] If the Commission determines that the project will have a significant impact on humans or the environment, the Commission may deny a route permit for the project under the partial exemption process. [147] The applicant may then request that their application be considered under the full review process.

Full review process

For the full review process, when the routing application is complete, the Commission refers the docket to the Office of Administrative Hearings (OAH) for a contested case hearing. The full review route permitting process is illustrated in Figure 14.

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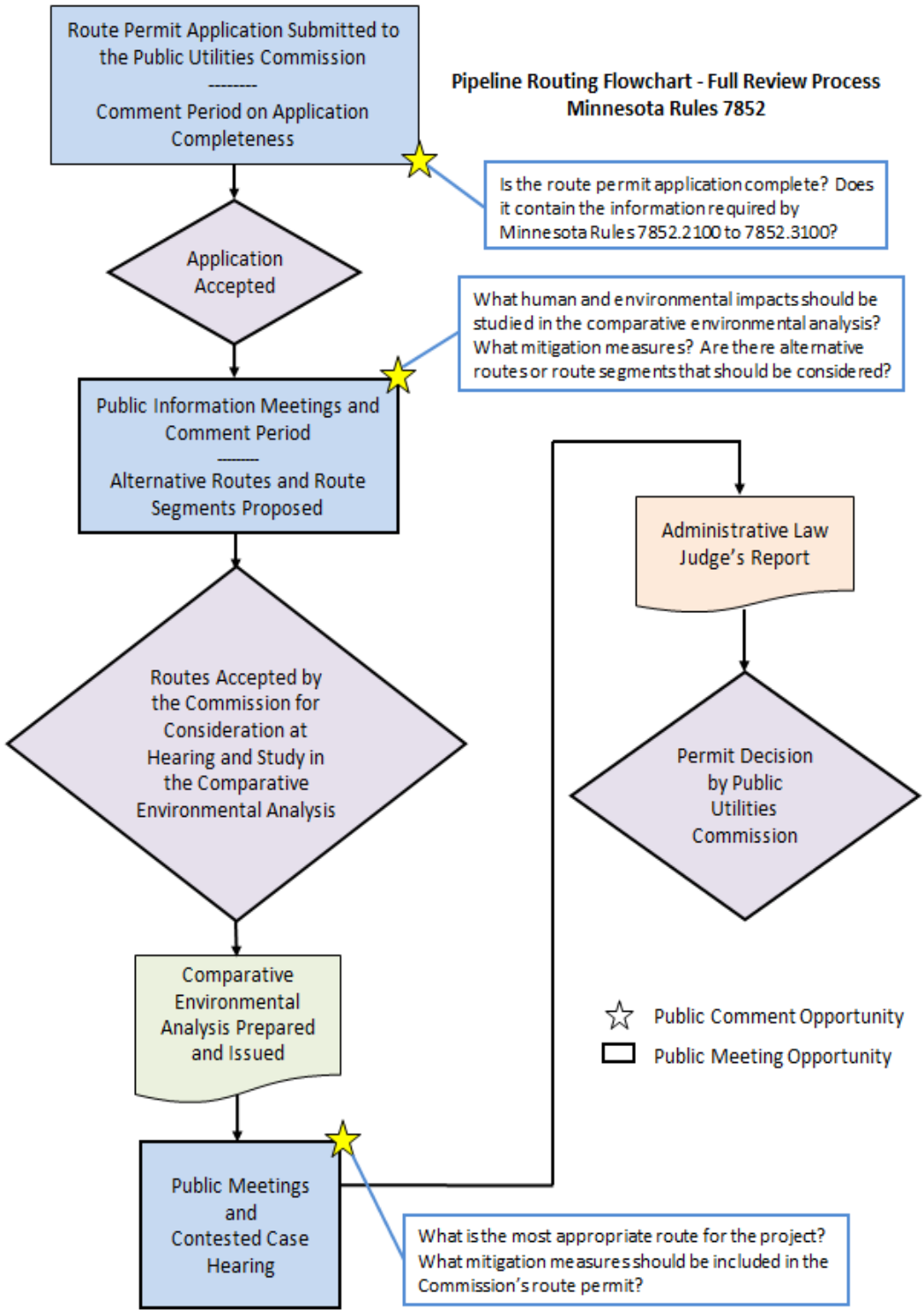
[139] Minn.Stat. § 216G
[140] Minn. Rule 7852.2700
[141] Minn. Rule 7852.2600.
[142] Minn. Rule 7852.0600.
[143] Minn. Rule 7852.0700.
[144] Minn.Stat. § 216G.02, Subd. 3, Minn. Rule 7852.0600.
[145] Minn.Stat. § 216G.02, Subd. 3, Minn. Rule 7852.0800.
[146] Minn. Rule 7852.0600, Subp. 5.
[147] Minn. Rule 7852.0600, Subp. 6.

Commission and Commerce-EERA staff conduct public information and scoping meetings in each county crossed by the applicant's preferred pipeline route to explain the route permitting process, to respond to questions raised by the public, and to solicit comments on issues and mitigation measures and alternative routes and route segments that should be examined in greater detail in the comparative environmental analysis.

After the public information meetings and close of the public comment period, the Commission determines the routes and route segments that will be evaluated in the comparative environmental analysis and considered in the contested case hearing. [148]

[148] Minn. Rule 7852.1400

Figure 14: Pipeline routing flowchart



Environmental review

The Minnesota Environmental Policy Act (MEPA) of 1973 authorizes the EQB to establish "categories of actions" for which environmental review is required. [149] The purpose of the environmental review is to provide information about a project's environmental impacts before approvals or necessary permits are issued. Under this authority, the Minnesota Environmental Quality Board (EQB) has rules requiring environmental review for the routing of pipelines that are "subject to the full route selection procedures" [150] of Minnesota Statute 216G.02. These rules authorize a mandatory environmental review with the Public Utilities Commission as the responsible governmental unit (RGU). Additionally, MEPA provides the authority to conduct environmental review under special procedures as alternative forms of environmental review. [151]

The EQB may approve "an alternative form of environmental review for categories of projects which undergo environmental review under other governmental processes."[152] The intent of alternative review is expediency – providing for the equivalent of an environmental impact statement in a "timelier or more efficient manner." [153] In 1989, the EQB approved the pipeline routing rules[154] as an alternative form of environmental review. During the route permitting process established by the pipeline routing rules, the alternative review must "address the same issues and utilize similar procedures as an environmental impact statement." [155] Because the pipeline routing rules are an alternative form of environmental review, pipeline projects in the routing process are not reviewed through environmental assessment worksheets (EAW) or environmental impact statements (EIS) and are exempt from other forms of environmental review[156].

EQB has the ability to review the approved alternative process at any time when "procedure[s] no longer fulfill the intent and requirements of the Minnesota Environmental Policy Act." [157] Any such review cannot affect projects currently in the approved alternative review process. [158] Periodic EQB reviews are built into MEPA and are critical to retaining the administrative procedures and civic engagement necessary to carry out its purpose.

The approved environmental review for pipelines includes the pipeline route application, a scoping process, and the preparation of an environmental review document known as a comparative environmental analysis (CEA). The CEA evaluates the potential human and environmental impacts of the routes and route segments authorized by the Commission for consideration in the contested case hearing, and the means by which these impacts might be avoided, minimized, and mitigated. [159] The Commission may authorize the CEA be prepared by the applicant or by Commerce-EERA. [160]

[149] Minn. Stat. § 116D.04, subd. 2a(a)
[150] Minn. Rule 4410.4400, subp. 24
[151] Ibid.
[152] Minn. Rule 4410.3600
[153] Minn. Stat. § 116D.03, subd.1 , Minn. Rule 4410.3600
[154] Minn. Rule 4415 (1989), Minn. Rule 7852 (2007)
[155] Minn. Stat. § 116D.04, subd. 4a.
[156] Minn. Rule 4410.3600, subp. 2, Minn. Rule 4410.4600, subp. 2(E)
[157] Minn. R. 4410.3600, subp. 2
[158] Ibid.
[159] Minn. Rule 7852.1500
[160] Ibid.

Content and procedural comparison of an environmental impact statement and a comparative environmental analysis

According to Minn. Stat. § 116D.04, subd. 4a, A CEA is designed to be equivalent to an EIS in the type and extent of its analysis. Comments on the CEA can be provided in the contested case hearing (described below). Though comments on the CEA are not included in a "final CEA" – i.e., there is not a draft and final CEA – comments on the CEA provided in the contested case hearing and responses by Commerce-EERA become part of the record and are considered by the Commission. If, based on the record, the Commission determines that analysis in the CEA requires supplementing; the Commission may request that Commerce-EERA supplement the CEA.

Contested case hearing – pipeline routing

Based on comments received during the public information and scoping meetings, the Commission determines the routes and route segments that will be considered in the contested case hearing and evaluated in the comparative environmental analysis. The Commission must accept all route and route segments proposed by the applicant for consideration in the hearing and evaluation in the CEA. The Commission may accept other routes or route segments that it "considers appropriate for further consideration." [161] The CEA is completed prior to the hearing and is submitted into the hearing as an exhibit. In the CEA, Commerce-EERA provides a technical analysis of the record; including analysis of the relative merits of routing options and identification of possible permit conditions.

After issuance of the CEA, public information meetings are conducted in each county with a proposed route. Contested case hearings conducted by an ALJ are typically held throughout the project area where citizens can present oral and written testimony, ask questions about the project, and ask questions of witnesses. Citizens can advocate for the route(s) that are most appropriate for the project and conditions that should be included in the Commission's pipeline route permit that would mitigate potential impacts of the project. Those people who have proposed a route or route segment that the Commission has accepted for consideration at the hearing are required to make an "affirmative presentation of facts on the merits of the route proposal at the public hearing." [162] During post-hearing briefing, Commerce-EERA updates its technical analysis of the record, including identifying the most appropriate route for the project and appropriate permit conditions. Commerce-EERA also responds to any comments on the CEA.

Based on the hearing and the record, the administrative law judge submits a report to the Commission with findings of fact, conclusions of law, and recommendations regarding a route permit for the project. The Commission uses the report and the record in selecting a route for the project and for determining appropriate conditions. The Commission is charged with considering the "characteristics, the potential impacts, and methods to minimize potential impacts" of the routes evaluated so that it may select "a route that minimizes human and environmental impact."[163]

Minnesota Rule 7852.1900 lists 10 criteria the Commission must consider in making a pipeline route permit decision, including impacts on human settlement, the natural environmental and local economies.

[161] Minn. Rule 7852.1400, subp 1.
[162] Ibid.
[163] Minn. Rule 7852.1900, subp. 2

Criteria considered by the Commission for pipeline route permits[164]

A. Human settlement, existence and density of populated areas, existing and planned future land use, and management plans.

B. The natural environment, public and designated lands, including but not limited to natural areas, wildlife habitat, water, and recreational lands.

C. Lands of historical, archaeological, and cultural significance.

D. Economies with the route, including agricultural, commercial or industrial, forestry, recreational, and mining operations.

E. Pipeline cost and accessibility.

F. Use of existing rights-of-way and right-of-way sharing or paralleling.

G. Natural resources and features.

H. The extent to which human or environmental effects are subject to mitigation by regulatory control and by application of permit conditions contained in part 7852.3400 for pipeline right-of-way The extent to which human or environmental effects are subject to mitigation by regulatory control and by application of permit conditions contained in part 7852.3400 for pipeline right-of-way preparation, construction, cleanup, and restoration practices.

I. Cumulative potential effects of related or anticipated future pipeline construction. The relevant applicant policies, rules and regulations of other state and federal agencies, and local government land use laws including ordinances adopted under Minnesota Statutes, section 299J.05, relating to the location, design, construction, or operation of the proposed pipeline and associated facilities.

Additional permits and approvals

A pipeline route permit from the Commission which determines where the pipeline will be located is the only state permit required for the routing of a pipeline. It is important that state agencies participate in the permitting process since the Commission's permit binds these state agencies. Agency participation can aid the Commission by indicating routes that are not permitable and route permit conditions that are appropriate for mitigating impacts of the pipeline.

The Commission's route permit does not preempt other state or federal permits for the construction and operation of the project (commonly referred to as "downstream permits" because they are subsequent to and dependent upon the Commission's routing decision). Downstream permits commonly required for a pipeline project are noted in Table 8.

[164] Minn. Rule 7852.1900

Table 8: Downstream permits and approvals commonly required for a pipeline project

Responsible agency	Permit and approvals
Federal permits and approvals	
U.S. Army Corps of Engineers	Clean Water Act Section 404 Permit (Wetlands)
	Navigable Water Crossing Permit
U.S. Fish and Wildlife Service	Section 7 Consultation (Endangered Species)
Minnesota permits and approvals	
Minnesota Pollution Control Agency	Section 401 Water Quality Certification
	National Pollutant Discharge Elimination System (NPDES/SDS) Construction Stormwater Permit and Construction Dewatering
	NPDES/SDS Wastewater Permit
	Environmental Spill Response Plan
	Stormwater Pollution Prevention Plan (SWPPP)
	Aboveground Storage Tank Permit
	Air Permit
Minnesota Department of Natural Resources	License to Cross Public Waters / Public Lands
	Water Appropriations Permit
	State Endangered / Threatened Species Consultation and Taking Permit
	Calcareous Fen Management Plan
Minnesota Department of Transportation	Road Crossing Permit
	Oversize/Overweight Load Permits
Minnesota Department of Agriculture	Agricultural Impact Mitigation Plan[165]
State Historic Preservation Office	Minnesota Historic Sites / Minnesota Field Archaeology
Local government permits and approvals	
County, Township, Soil and Water Conservation District	Wetland Conservation Act Approvals and Compliance
County Township, City	Road Crossing Permit

[165]Though included here as a downstream permit, the Agricultural Impact Mitigation Plan is developed concurrently with the Commission's pipeline route permit and has no effect until enforced through the Commission's permit.

Select downstream permits from state agencies

Minnesota Pollution Control Agency permitting

The construction, installation and operation of pipelines, tank terminals and refineries may require MPCA permits for air quality, [166] above-ground storage tanks, [167] wastewater, [168] industrial stormwater, [169] construction stormwater, [170] emergency spill response plan, [171] and Section 401 Water Quality Certification. [172]

- **Air Permit –** An air emissions permit may be required for a storage facility that has a potential to emit any regulated pollutant in greater than specific threshold amounts, or is subject to a rule such as a new source performance standard that specifically requires a permit. If an air emissions permit is required, it must be obtained before construction or operation of that facility can begin.
- **Environmental Spill Response Plan –** Pipeline operators are required to submit a response plan to the Pipeline and Hazardous Materials Safety Administration. The response plan must address a worst-case discharge, identify environmentally and economically sensitive areas, and describe the responsibilities of the operator and others in removing such a discharge.
- **Above-ground Storage Tank Permit –** Facilities that have the capacity to store 1million gallons or greater of any liquid substance that could cause water pollution must apply to the MPCA for a major facility permit following procedures outlined in Minnesota Rules 7001.4200 -.4300. The goal of this permit is to prevent pollution of waters of the state. However, these permits are not required for break-out tanks. Above-ground storage tanks with the capacity to store less than 1 million gallons must comply with the requirements in Minn. Rules chapter 7151.
- **Section 401 Water Quality Certification –** Projects that require federal permits also are subject to the review requirements of the MPCA's Water Quality Certification program, to ensure that the projects will meet state water quality standards. This includes review of pipeline projects that require individual permits from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act (discharge of dredge and fill material) or under Section 10 of the Rivers and Harbors Act (construction of structure in or over navigable waters), and hydropower projects licensed by the Federal Energy Regulatory Commission.
- **NPDES/SDS General Construction Stormwater Permit –** A permit is required when a project disturbs one or more acres of land. The general permit requires 1) use of best management practices; 2) a sediment and erosion control plan that details the specific measures to be implemented, phasing of construction, timeframes for implementing erosion controls, and inspection of erosion control measures after implementation; and 3) adequate stormwater treatment capacity to mitigate water quality impacts from runoff once the project is constructed.
- **NPDES/SDS Industrial Stormwater Permit –** The permit requires that specific conditions be adhered to for construction and operation based on the type of facility, and for overall compliance with water quality requirements. A Stormwater Pollution Prevention Plan, including benchmark monitoring is required.

[166] Minn. R. 7007.0150
[167] Minn. R. 7001.0020.H
[168] Minn. Rule 7001.1030
[169] Ibid.
[170] Ibid.
[171] Minn. Stat. Chapter 115E
[172] Minn. Rule 7001.1420

- **NPDES/SDS Wastewater Permit –** A permit is required to discharge hydrostatic test waters used to test new and existing pipelines and trench waters. Provisions of this permit may also address the storage and maintenance of material handling equipment, and for storage areas for raw materials such as tank farms. The permit authorizes a discharge flow and assigns effluent water and waste loading limits to protect receiving waters.
- The owner of the pipeline applies for an individual permit that covers construction stormwater, trench dewatering, and hydrostatic testing. The individual permit requires the permittee to request a letter of authorization for each small project covered under the individual permit. The permit does not allow for a discharge without seeking authorization for each individual project's discharge.

Department of Natural Resources permitting

The DNR permits activities associated with pipeline development as a substantial landowner and land administrator along pipeline routes, and reviews pipeline projects for impacts to natural resources. The DNR reviews and comments on projects in order to meet statutory obligations developed to ensure natural, recreational, and cultural resources are protected. The DNR has jurisdiction over wildlife in Minnesota and administers the Minnesota Outdoor Recreation System. [173] This includes Wildlife Management Areas, Scientific and Natural Areas, State Parks, State Forests, State Recreation Areas, and other DNR managed lands.

Project developers intending to cross over, under, or across any state land or public water with any utility need to first secure a DNR License to Cross[174] and other applicable permits.

- **License to Cross Public Lands and Waters –** The focus of this license is to minimize impacts on public waters and state land during pipeline construction, and to restore those sites after construction. The DNR land and water crossing licenses promote the use of bioengineering methods in stream crossing restoration, use of native species in re-vegetation, and monitoring and control of invasive species on the pipeline right-of-ways. The DNR Lands and Minerals Division coordinates license reviews and issues utility licenses to cross public

Rights-of-way and easements for pipeline construction and operation

The construction and operation of an oil pipeline will impact multiple landowners. In order to ensure that the particular lands and rights-of-way required for a project can be obtained, pipeline route permits issued by the Commission grant permittees the power of eminent domain to acquire or "take" property interests (generally easements) for a project (Minnesota Rule 7852.3200).

"Eminent domain" is the power to take privately owned property and convert it to public use, subject to just compensation for the taking (Minnesota Statute 117). Despite good faith negotiations, it's possible that a landowner and a pipeline permittee will not be able to reach agreement on the terms of an easement for a project. Under these circumstances, and through the condemnation process, three Court-appointed impartial commissioners determine the amount of compensation due to the landowner for the taking of the land.

For additional information, see the DOC right-of-way and easement fact sheet: http://mn.gov/commerce/energyfacilities/documents/Easements%20Fact%20Sheet_08.05.14.pdf

[173] Minn. Stat. § 86A and § 84.027, subd. 2
[174] Minn. Stat. § 84.415. *Information about the License for Utility Crossings can be found at:* http://www.dnr.state.mn.us/permits/utility_crossing/index.html.

waters and state lands managed by the DNR. Crossing of state lands that were acquired with funding restrictions usually requires additional review.

- **Water Appropriations Permit –** Many times, pipeline projects require dewatering during construction or during hydrostatic testing, which require a water appropriations[175] permit from the DNR Ecological and Water Resources Division. This is required when users are withdrawing more than 10,000 gallons of water per day or one million gallons per year.
- **Threatened and Endangered Species Taking Permit –** Minnesota's endangered species law[176] and associated rules parts 6212.1800 to 6212.2300 and 6134, prohibit the taking of state-listed endangered or threatened species without a permit. [177] Surveys for rare species may be required in order to determine if the proposed project would result in a taking. Some species can only be surveyed at specific times of the year.
- **Calcareous Fen Management Plan –** Calcareous fens are rare and distinctive peat-accumulating wetlands, which have additional legal protection in Minnesota. They are designated as "outstanding resource value waters[178]" in water quality regulations[179] and the Wetlands Conservation Act, [180] states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan. In addition, destruction of any state-threatened or endangered plants in a calcareous fen would also be regulated under Minnesota's endangered species law.

Board of Water and Soil Resources and local government units permitting

- **Wetland Conservation Act (WCA) –**BWSR is the state agency responsible for promulgating WCA rules and oversight of local government unit's implementation activities. Projects associated with pipelines often cross multiple local government boundaries. In these instances, BWSR staff will typically coordinate the review of submitted materials and decisions on applications among the affected governments. The WCA regulates activities that result in impacts to wetlands. A wetland impact is a loss of wetland quantity, quality, or biological diversity caused by draining, filling, or in some cases excavation. The WCA requires anyone proposing to impact a wetland to first try to avoid the impact; second, to try to minimize unavoidable impacts; and, finally, to replace any lost wetlands. Since the WCA is based solely on state law, connectivity to navigable waters or federal jurisdiction does not affect this program. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects on land where specific pre-established land uses are present to proceed without avoidance, minimization, or replacement. The WCA has jurisdiction over wetlands on privately-owned land and land owned by the state or a local government. Tribal land and land owned by the federal government doesn't generally fall under the jurisdiction of the WCA.

[175] Minn. Stat. § 103G.271; 6115.0710. Additional information about DNR water use permits is available at:http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html
[176] Minn. Stat. § 84.0895
[177] Additional information about the DNR Threatened and Endangered Species Taking Permit: http://www.dnr.state.mn.us/nhnrp/endangered_permits.html
[178] Minn. Rule 7050.0180
[179] Minn. Rules Chapter 8420.1010 - 8240.1060
[180] Minn. Stat. 103G.223

Local zoning and land use rules

The Commission's pipeline route permit supersedes local planning and land use regulations and ordinances. [181] As with state agencies, the Commission's permit binds local government units with respect to the location of the pipeline. However, permittees must obtain all local approvals that address interests not covered by the Commission's permit... Local governments cannot deny routing of a pipeline, but may place conditions on such approvals. Typical local approvals include pipeline road crossing permits and utility permits.

Mitigation of human and environmental impacts

The Commission is charged with issuing a pipeline route permit that minimizes human and environmental impacts.[182] In addition to selecting a route that avoids impacts to the extent practicable, pipeline route permits contain measures to mitigate pipeline impacts. These measures address such topics as agricultural mitigation, environmental mitigation, construction practices, and compliance with federal, state, and local permits.[183] Mitigation plans that are commonly required for a pipeline project are noted in Table 11. All pipeline projects must comply with the conditions for right-of-way preparation, construction, cleanup, and restoration found in Minnesota Rule 7852.3600.

The Commission route permit may also contain special permit conditions. These special conditions are conditions that flow from the record into the permit and reflect project-specific measures to avoid, minimize, and mitigate potential pipeline impacts. Though special permit conditions are project specific, there are several common types of special permit conditions: [184]

[181] Minn. Stat. 216G.02, Subd. 4.
[182] Minn. Rule 7852.1900, subp. 2
[183] See, e.g., Pipeline Routing Permit for Construction of the Alberta Clipper Pipeline, December 29, 2008, PL-9/PPL-07-361, eDockets Number 5679213.
[184] The common types of special permit conditions listed here are examples; they may or may not be included in a specific Commission pipeline route permit. Whether a special permit condition, or any permit condition, appears in a Commission route permit depends on the record developed during the permitting process. Conditions flow from the record into the permit.

Table 9. Mitigation plans commonly required for a pipeline project

Spill Prevention, Containment, and Control Plan
Pipeline Integrity and Emergency Response Plan
Petroleum Contaminated Soil Management Plan
Plan for the Discovery of Cultural or Historic Resources During Construction
Drilling Mud Containment, Response, and Notification Plan
Agricultural Impact Mitigation Plan
Storwater Pollution Prevention Plan
Spill Response Plan
Construction Environmental Control Plan
Environmental Mitigation Plan
Protected Species Plan
Noxious Weeds and Invasive Weed Plan
Revegetation and Restoration Monitoring Plans
Environmental Clearance Plan for Access Roads
Anthrax Mitigation Plan
Botrychium Avoidance and Monitoring Plan
Complaint Receipt and Response Procedures
Wetland Replacement Plan

- **Avoidance of impacts -** Special conditions describing areas of the project where the permitted route avoids certain features or is narrowed to avoid certain features. The features can be manmade features (homes, infrastructure) or natural features (areas of outstanding biodiversity).
- **Environmental monitors –** Requirement for independent environmental monitors that report to specific state agencies on the implementation of mitigation measures called for in the route permit and in agency approvals.
- **Construction environmental control plan** – Permittees prepare a construction environmental control plan for their projects. This plan spells out the processes and procedures by which mitigation measures for all permits and approvals for the project will be implemented.
- Develop and implement an agricultural impact mitigation plan[185] that addresses topsoil separation and management, soil compaction, tile line avoidance and repair, and organic agriculture.

Conditions in a Commission pipeline route permit are administered and enforced through the Commission's permit. However, there is overlap and coordination between the Commission's permit and downstream agency permits. For example, the agricultural impact mitigation plan is approved by the Department of Agriculture but is administered and enforced through the Commission's permit. Likewise, environmental monitors required under the Commission's permit monitor for compliance with the Commission's permit and downstream agency permits.

Commerce-EERA assists the Commission's enforcement of permit conditions by reviewing permit compliance filings and providing technical analysis and recommendations to the Commission.

Evolution of agricultural impact mitigation plans

The plans have evolved over time, and issues have arisen and been addressed. Some of these issues include:

Compliance. Limited state resources have led to the creation of "agricultural monitors". The monitor is a third-party retained by the pipeline proposer responsible for reporting to the Minnesota Department of Agriculture. The monitor tracks the proposer's environmental inspectors, identifies issues that occur during construction, and reports and discusses these issues with the department.

Management of change. Experience has shown that there are unanticipated issues that arise during construction that were not in the plan. This has resulted in provisions relating to the management of change, which specify when and how provisions of the plan can be modified, and what levels of approval are required.

Organic farms and the development of the organic agriculture appendix. In review of a pipeline in 2006, the proposed crossing of a prominent organic farm prompted development of provisions specific to organic agriculture, including recognizing and using practices that conform to the organic system plan for the farm (a requirement of organic certification), and measures to prevent introduction of substances prohibited by the organic certification.

Extent of topsoil stripping. How much of the right-of-way should be stripped of topsoil has evolved over time. The thickness of topsoil can vary along the length of a pipeline. Ultimately, it is advantageous to vary the width of topsoil stripping according to topsoil depth.

[185] Minn. Stat. § 216E.10, Subd. 3(b).

Restoration and certification

After pipeline construction and all restoration measures, permittees must file with the Commission a certification that the pipeline has been constructed in compliance with all pipeline route permit conditions.[186] The Commission reviews the certification and informs the permittee of any deficiencies which, if corrected, would allow the certification to be accepted. Once the certification is accepted, the Commission's jurisdiction over the pipeline route permit is terminated.

Evolution and improvement of the pipeline route permitting process

Over the past 10 years, the pipeline route permitting process for addressing potential impacts has evolved and improved, so that potential environmental impacts from pipelines are either avoided or mitigated. These improvements fall into three categories: 1) mitigation plans, 2) environmental monitors, and 3) permitting process improvements.

Mitigation plans

Mitigation plans included in recent Commission's pipeline route permits – specifically, the agricultural impact mitigation plans and the construction environmental control plan, have improved the efficacy of mitigation measures and coordination between the Commission's route permit and downstream agency permits.

In 2005, the Minnesota Legislature incorporated into statute the role of the MDA in advising the Commission on potential impacts to agricultural lands due to pipeline projects and made the MDA the lead agency for the development of agricultural impact mitigation plans.[187] As a result, agricultural impact mitigation plans are now developed jointly by the MDA and pipeline permit applicants on a project-by-project basis, approved by the MDA, and included in Commission route permits as a special permit condition (discussed above).

The requirement for a construction environmental control plan imposes a discipline on permittees to organize their environmental controls and processes and provide a means for the Commission and agencies to more easily review compliance with their permits.

Environmental monitors

Recent Commission permits require the use of third-party environmental monitors to review and report on the implementation of mitigation measures called for in the Commission's route permit and in agency approvals. Monitors are typically dedicated to and report to specific agencies. Monitors are paid for by the permittee.

Related to the use of environmental monitors is the use of electronic communications to share monitoring and construction information. Permitting agencies are now able to view monitoring reports, photographs, and construction plans in near real time. This form of monitoring allows agencies to quickly review monitoring data and to share data among agency staff that have expertise regarding the resource(s) at issue but who are geographically distant from the project.

[186] Minn. Rule 7852.3900
[187] Minn. Session Laws 2005, Chapter 97, article 3, section 10(b).

Permitting process improvements

Three process steps included in recent Commission pipeline route permitting processes have improved the environmental review and hearing process, and thus the record the Commission bases its permit decision on: improved notice to agencies, use of a generic route permit template, and environmental review conducted by Commerce-EERA.

Notice to agencies regarding participation in the pipeline route permitting process is provided by Commerce-EERA and the Commission. Commerce-EERA provides notice to agency staff regarding opportunities to participate in the route permitting process, and provides copies of applications and environmental review documents. Commerce-EERA also coordinates with agency staff on questions and comments throughout the permitting process. For more recent pipeline projects, the Commission has requested agency participation in the development of the record during the environmental review and hearing process.

For more recent pipeline projects, the Commission has issued a generic pipeline route permit template in advance of the environmental review and hearing process. This template provides citizens and agencies an early opportunity to review the Commission's standard permit language for pipelines and to suggest additional language and/or permit conditions for the proposed project.

In developing the comparative environmental analysis for a project the Commission may authorize the analysis be prepared by the applicant or by Commerce-EERA. [188] For more recent projects, the Commission has authorized Commerce-EERA to prepare the analysis. This change likely improves public confidence in the objectivity of the comparative environmental analysis. Additionally, it likely improves the visibility and usefulness of the document, by making it a single document entered as an exhibit of Commerce-EERA, rather than a document that is entered into the record in several parts by various applicant witnesses.

[188] Minn. Rule 7852.1500.

Findings and considerations

The Commission administers the Certificate of Need process and the route permitting process for crude oil pipelines within the state of Minnesota. The Commission is charged with issuing a permit that minimizes human health and environmental impacts.[189] In addition to selecting a route that avoids impacts to the extent practicable, pipeline route permits also contain measures to mitigate pipeline impacts. Impacts are also mitigated by other applicable federal and state permits that overlap and coordinate with the Commission's pipeline route permit.

Federal approvals

- The state of Minnesota has regulatory authority to determine if an oil pipeline is needed (Certificate of Need) and, if so, where it should be routed (route permit). When determining whether a specific pipeline is needed, the Commission considers, among other record evidence, FERC-approved rates and terms of service. These rates and terms of service inform the costs of a proposed pipeline project and may inform delivery points and other terms of service. This information is valuable to the Commission in determining whether there are reasonable and prudent alternatives to a proposed project. FERC proceedings that determine rates and terms of service can occur before or simultaneously with Commission dockets. The state of Minnesota should consider studying the feasibility of participating in FERC proceedings where rates and terms of service for oil pipelines that would enter the State of Minnesota.

Public participation

- The Commission relies on public participation to develop a robust and comprehensive record upon which it can make Certificate of Need and route permit decisions. This participation includes participation by citizens, local governments, and state agencies. The Commission's Certificate of Need and route permit proceedings provide multiple opportunities for public participation. The state of Minnesota's electronic docketing system used for Certificate of Need and route permit proceeding makes all documents in these records readily available to citizens, local governments, and state agencies.

Certificate of Need

- In determining whether a Certificate of Need should be approved, conditioned, or modified, the Commission considers the natural and socioeconomic impacts of system alternatives. The applicant, parties, agencies, and citizens can submit information and analysis regarding these potential impacts into the Certificate of Need record. While Minnesota Rule 7853 does not call for a separate environmental analysis document as part of Certificate of Need proceedings, the Commission may request environmental analysis documents as part of the need proceedings.

  Discretion regarding the development of environmental analysis documents aids the Commission's tailoring of the Certificate of Need process to best fit the scope and complexity of the project at hand. This discretion, however, may make it relatively more difficult for the public to determine when and how they can participate in the need proceedings. When the Commission does not request that Commerce-EERA prepare environmental analysis for a project, it may place greater responsibility on the public to provide such analysis or portions of this analysis and enter it into the Certificate of Need record.

[189] Minn. R. 7852.1900, subp. 2

For high voltage transmission lines that require a Certificate of Need, Commerce-EERA is required to prepare an environmental review document known as an environmental report. [190] The report addresses the potential human and environmental impacts of the project and of alternatives to the project. [191] The scope of the environmental report is informed by a public scoping process. [192] The report is issued in a final form – there is not a draft issued for comment and a final document. [193] If a Certificate of Need process and a transmission line routing process are proceeding concurrently, Commerce-EERA can elect to develop one environmental review document that addresses both need (alternatives to the project) and routing (routing alternatives). [194]

If the pipeline Certificate of Need rules were amended to incorporate an environmental report-like process and analysis, it could broaden opportunities for public participation and could limit any burdens placed on the public to provide environmental analysis into the Certificate of Need record. An environmental report-like process and analysis would likely limit the discretion of the Commission to tailor its Certificate of Need process and would likely lengthen the process to accommodate preparation of an environmental report, or an environmental report-like, document.

- The Commission, through several recent orders, has established various requirements, conditions, or procedures that have refined the Certificate of Need process on a case-by-case basis. These actions are supported by many state agencies and recommended to continue as the Commission sees fit.

Route permit proceedings

Environmental review

- Pipeline route permit proceedings are governed by Minnesota Rules Chapter 7852. The EQB developed and approved these rules as an alternative form of environmental review pursuant to Minnesota Rules 4410.3600. The pipeline routing rules require the preparation of a comparative environmental analysis. The scope of the analysis is developed through a public scoping process. The comparative environmental analysis is issued in a final form. Comments on the CEA can be submitted during the hearing process and are responded to by Commerce-EERA in post-hearing briefing. However comments are not incorporated into a final CEA document. The Commission may authorize the analysis be prepared by the applicant or by Commerce-EERA.

  Revising the pipeline routing rules to provide for issuance of the CEA in a draft form, with comments and responses from Commerce-EERA integrated into a final document, could improve the record for the Commission's decision. However, such a change would lengthen the routing process and would be inconsistent with the statutory timeline for the pipeline routing approvals.

  As discussed above in this section, preparation of the CEA by Commerce-EERA, rather than the applicant, likely improves public confidence in the objectivity of the analysis and the usefulness of the document.

- On September 14, 2015, the Minnesota Court of Appeals ruled that in the matter of the *Application of North Dakota Pipeline Company LLC for a Certificate of Need for the Sandpiper*

[190] Minn. Rule 7849.1200.
[191] Ibid.
[192] Minn. Rule 7849.1400.
[193] Ibid.
[194] Minn. Rule 7849.1900.

Pipeline Project, that the responsible governmental unit, the Public Utilities Commission, complete an environmental impact statement prior to issuing a certificate of need for projects that do not concurrently processed with the certificate of need and permitting procedures. The ruling overturns a Commission decision which granted a pipeline a certificate of need.

- Recent action by the Minnesota Court of Appeals has brought attention to the form of environmental review necessary in considering crude oil pipeline proposals, a subject likely to be addressed by both policy makers and regulators.

Lifecycle assessment of oil production, transportation and use

- Minnesota's approval process for oil pipelines examines the potential impacts of a pipeline. These approvals typically do not address other process steps necessary for the use of oil products, for example, production, refining, and end uses. In general, this is because these other process steps have approvals and environmental analyses, whether state, local, or federal, dedicated to these process steps. For example, if oil is produced in the Bakken, production is regulated through approval processes in North Dakota. Likewise, oil production in Canada is regulated through Canadian approval processes.

  What is not well captured by this system are impacts that emerge from the steps as a whole – impacts that emerge from the systematic production, transport, refining, and use of oil products. Climate change due to greenhouse gases is one such impact; there may be others. A holistic review and analysis of the potential impacts of oil production, transport, refining, and use, including but not limited to the impact of greenhouse gases, may benefit Minnesota decision-makers.
- A holistic analysis of the potential impacts of oil production, transportation, refining, and use (at most any scale – Minnesota, Upper Midwest, U.S.) would be challenging. Additionally, the reliability and usefulness of models to perform such an analysis are uncertain. [195]

Route permit

- In making a pipeline routing decision, the Commission is guided by the pipeline routing criteria of Minnesota Rule 7852.1900. There are likely several indicators that could be used to evaluate potential impacts of a project relative to these criteria. Coordination among state agencies as to the indicators and data sets that are best suited for informing the pipeline routing criteria would likely improve the comparative environmental analysis. Such coordination would ensure that the most appropriate indicators are being used for environmental review and would aid agency comments during the route permitting process.
- Conditions in a Commission pipeline route permit are administered and enforced through the Commission's permit. However, there is overlap and coordination between the Commission's permit and downstream agency permits. For example, the AIMP is an MDA approval that is administered and enforced through the Commission's permit. Likewise, environmental monitors required under the Commission's permit can aid compliance with other applicable federal and state permits.

[195] Lightfoot, Thaddeus R. (2010) *Climate Change and the Environmental Review: Addressing the Impacts of GHG Emissions Under the Minnesota Environmental Policy Act*, 36:3 William Mitchel Law Review.

Downstream permits and early notification

- Downstream permits for a pipeline project are informed by the Commission's route permitting process. Participation by state agencies and local governments in the Commission's process is key to developing a record that supports downstream permitting.

  In addition to participation in the Commission's process after a route permit application is accepted, agencies and local governments may benefit from communication with prospective pipeline route permit applicants before an application is submitted. Through early consultation, agencies and local governments will likely be better prepared for the Commission's routing process. Agencies and local governments may also be able to work with applicants to address areas of concern before an application is submitted.

  Pre-application coordination and consultation between applicants and agencies and local governments could be accomplished by a voluntary joint agreement or a guidance document. For example, Commerce-EERA provides application guidance to wind farm proposers, to guide their development of site permits for wind farms. [196]

  Consultation could also be done through revisions to statute or rule. For example, the Legislature added pre-application consultation with local governments to the Power Plant Siting Act in 2008. [197] With the addition, prospective applicants for a route permit for a high voltage transmission line must, 90-days before filing an application with the Commission, provide notice to local governments along the proposed route and provide an opportunity for a consultation meeting before the application is submitted. [198]

- The jurisdiction of the Commission over oil pipelines, as exercised through a pipeline route permit, ends when a permittee demonstrates that all pipeline permit conditions, including restoration, have been accomplished. The Commission's permit is a "construct-and-restore" permit; it is not an operational permit – in other words, other agencies, such as the Minnesota Office of Pipeline Safety, and Minnesota Pollution Control Agency, have jurisdiction over the operation of oil pipelines.

  In contrast to pipelines, the Commission issues an operational permit for wind farms, typically 30-years long, that requires a permittee to describe how the wind project will be decommissioned and how funds will be ensured for decommissioning and restoration. [199] Moreover, other state agencies also issue operational permits that require financial assurance for certain projects to ensure that neither the state nor the environment is left compromised in the event of an accident or at the end of life of the project. For example, the DNR requires that permittees engaged in nonferrous mineral mining ensure funds for reclamation activities, including mine closure, and for any corrective actions necessary to comply with design and operation criteria. [200] The MPCA requires that permittees operating landfills ensure funds for closing the landfill, post-closure care, and any corrective actions. [201]

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[196] Application Guidance for Site Permitting of Large Wind Energy Conversion Systems (LWECS) in Minnesota, August 2010, http://mn.gov/commerce/energyfacilities/documents/LWECS_APP_Guide_AUG2010.pdf.
[197] Minnesota Session Laws 2008, Chapter 296, article 1, sections 15 and 16; Minnesota Statute 216E.03, Subds. 3A and 3B.
[198] Minn. Stat. 216E.03, Subds. 3a and 3b.
[199] Minn. Rule 7854.0500.
[200] Minn. Rule 6132.1200.
[201] Minn. Rule 7035.2695.

Large crude oil pipelines arguably have some of the same environmental and financial risks and may benefit from some form of financial assurance for pipeline construction, operation and maintenance, spill response, and decommissioning. There are likely several ways to ensure that such funds are available. Financial assurance may be raised and explored in the record during the Commission's pipeline proceedings.

Land-owner considerations

- The pipeline routing rules require that the Commission consider the use of existing rights-of-way and right-of-way sharing when issuing a pipeline route permit. As a result, and because many potential pipeline impacts can be avoided by routing a pipeline where there is existing infrastructure, it is not uncommon for landowners who have a pipeline crossing their property to have several pipelines crossing their property, with several associated pipeline easements. This use and sharing of existing right-of-way mitigates potential pipeline impacts but does so at the risk of creating "route fatigue" for those landowners who live alongside existing infrastructure.

  As discussed in this section, pipeline route permits issued by the Commission grant permittees the power of eminent domain to acquire or "take" property interests to construct a pipeline. Pipeline permittees typically acquire easements from landowners for pipeline projects.

  Under Minnesota Statute section 216E.12, sometimes referred to as the "Buy the Farm" statute, for certain high voltage transmission lines landowners may elect for a permittee to purchase their property rather than acquiring an easement. The statute applies only to transmission facilities that operate at 200 kV or more and to properties that meet certain other criteria. If all criteria are met, a landowner may elect for a permittee to purchase "any amount of contiguous, commercially viable land" owned by the landowner in lieu of an easement. [202]

  The landowner protections of Minnesota Statute section 216E.12 are not available to landowners whose property is crossed by an oil pipeline pursuant to a Commission pipeline route permit. Extension of "Buy the Farm" protections to oil pipelines would help mitigate impacts to landowners, particularly those landowners whose land is crossed by multiple pipelines. Extending these protections would likely increase the costs associated with property acquisitions for pipeline projects.

Summary of public comments

During public review of this report, some regulatory-related comments received expressed the following:

- The current Commission process has served Minnesota well.
- Requests for reconsideration of prior EQB approval for alternative review of pipeline projects.
- Requests for more opportunities for public involvement in the decision-making processes for project approvals, including additional consultation with Tribal nations.
- Requests for greater recognition of Tribal treaty rights, particularly usufructuary rights.
- More review of eminent domain authorities and land owner rights.
- Concern with the current level of environmental review in the Certificate of Need process.
- Concern that changes in the review process could lead to delays in meeting national needs for affordable oil.

[202] Minn. Statute 216E.12, Subd. 4

- More oversight needed for abandoned pipelines; development of a pipeline decommissioning process.
- Minnesota should consider the feasibility of participating in FERC proceedings.
- More discussion needed for assessing social impacts of a project.

More study needed

Regulatory issues identified for more study include:

- Better understanding of processes and policies needed to improve coordination and consultation with Minnesota's Tribal Nations; regarding pipeline projects.
- Better understanding of decommissioning processes and requirements for pipelines.
    - As a result of recent judicial review more discussion on the environmental review process may be warranted; to provide clarity to all parties

Spill prevention, preparedness, emergency response, and safety

This section reviews the laws, regulations, and policies governing transporting crude oil by pipeline across Minnesota. The discussion can be broken down into three parts— prevention of accidents and spills related to oil pipelines, company preparedness, and emergency response.

Pipelines in Minnesota

Minnesota pipelines, including those carrying crude oil or petroleum products are categorized as *intrastate* or *interstate*. Intrastate pipelines start and end within the state, while interstate pipelines carry products across state lines. These are valuable distinctions because the two pipeline categories operate under different requirements and oversight. Minnesota Office of Pipeline Safety (MNOPS) inspects both categories of pipelines under authority of the U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (PHMSA), and submits an application for certification annually to the federal government to carry out its pipeline safety and damage prevention roles. [203] The state may adopt additional or more stringent safety standards for *intrastate* pipelines[204], but the state is prevented by this law from adopting additional or more stringent safety standards for *interstate* pipelines. [205]

The following table shows that the vast majority of the pipelines carrying crude oil or petroleum products are categorized as *interstate* and regulated by federal government through the certification of a state agency, MNOPS.

Table 10: Minnesota hazardous liquid pipelines and breakout tanks206

Commodity	***Interstate* miles**	***Intrastate* miles**	**Total miles**	**Miles of gathering**	**Breakout tanks**
Crude oil	2,654.5	4.7	2,659.2	0.0	32
Highly volatile liquids flammable / toxic	564.0	8.0	572.0	0.0	13
Refined petroleum products	1,708.8	12.9	1,721.7	0.0	88
Totals	**4,927.3**	**25.6**	**4,952.9**	**0.0**	**133**

[203] As noted in Title 49 United States Code § 60105
[204] Title 49 U.S. Code § 60104
[205] Minn. Stat. 299J provides MNOPS with statutory authority for inspection and investigation of interstate pipelines.
[206] U.S. DOT Pipeline and Hazardous Materials Safety Administration 10/26/2015, http://www.phmsa.dot.gov/pipeline/library/data-stats

Spill prevention

A spill is the unintended loss of oil from the pipeline system and a rupture is a sudden and catastrophic loss and leak. The hazards, damage, and cleanup of each pipeline spill, leak, or rupture depends entirely on incident-specific factors. The eventual hazard and damage depends on the location of the spill, type of oil, quantity, topography, soils, hydrology, adjacent and downstream land type and use, weather, luck, and response by the spiller. Prevention is one measure to minimize the potential of a spill or a rupture.

Inspections conducted by state agencies and companies and the repercussions that may follow such as modifying operation and maintenance plans, corrective action or even enforcement to prevent and mitigate harm to human health and the environment. Safety regulations and education are also important components of prevention and an obligation of the state and companies.

Safety

Pipeline operators are required to comply with federal pipeline safety regulations specified in Title 49 CFR Part 195. [207] In addition to reporting requirements, pipeline companies are required to comply with regulations pertaining to the following:

- Design
- Construction
- Pressure testing
- Operations and maintenance
- Qualification of pipeline personnel
- Corrosion control

Table 11: Minnesota oil pipeline mileage by installation year[208]

Pre 1920 or unknown	8.6
1920 to 1929	0
1930 to 1939	1.5
1940 to 1949	558.5
1950 to 1959	1,195.8
1960 to 1969	512.6
1970 to 1979	680.7 429.2
1980 to 1989	358.83
1990 to 1999	10.51
2000 to 2009	1,047.92
2010 to 2014	5.96
Total mileage	4,380.92

A spill is the unintended loss of oil from the pipeline system and a rupture is a sudden and catastrophic loss and leak. The hazards, damage, and cleanup of each pipeline spill, leak, or rupture depends entirely on incident-specific factors. The eventual hazard and damage depends on the location of the spill, type of oil, quantity, topography, soils, hydrology, adjacent and downstream land type and use, weather, luck, and response by the spiller. Prevention is one measure to minimize the potential of a spill or a rupture.

Operators of pipelines constructed before 1979 are not held to requirements pertaining to design, construction or pressure testing, but they must comply with reporting, operation, and maintenance and corrosion control requirements regardless of age.

[207] Title 49 CFR Part 195
[208] Data Source: U.S. DOT Pipeline and Hazardous Materials Safety Administration 10/26/2015 http://www.phmsa.dot.gov/pipeline/library/data-stats

For newer pipelines, those constructed after 1979, design and construction requirements are important safety standards. Design requirements are among the ways a pipeline's maximum operating pressure is determined. Regulations incorporate industry standards and specifications to define safe operating pressures. Maximum operating pressure is based on the pipe material (steel for liquid pipelines), valves, fittings, and external loading. Construction regulations determine installation locations, transportation and installation of pipe, welding and fabrication methods, location of valves, inspection, testing and record keeping – all integral to safe operation of a pipeline system.

MNOPS inspections

Minnesota Office of Pipeline Safety carries out its safety role by conducting routine pipeline inspections and investigations of pipeline accidents. Routine inspections include reviewing pipeline operator procedures, training and records, and observe practices and conditions in the field to ensure compliance with state[209] and federal regulations. [210] MNOPS also conducts construction inspections, and in the event of a pipeline accident, inspectors conduct investigations to determine whether the pipeline operator followed proper procedures and maintained regulatory compliance, and ensure that the operator takes steps to prevent similar incidents from occurring in the future. Inspections are part of the agreement with the Pipeline and Hazardous Material Safety Administration and interstate pipeline facilities are inspected as directed by the Interstate Inspection Plan. [211] The administration prioritizes annual interstate inspections by risk elements pertaining to each pipeline operator. Risk elements include date of installation, installation methods, location, accidents, and leaks. PHMSA creates an annual interstate inspection plan and MNOPS carries it out.

Between 1994 and 2015, 432 inspections of various types on crude oil and petroleum pipelines have been completed by MNOPS.

Table 12: Oil and refined petroleum pipeline inspection cases (1994-2014) [212]

Construction inspection	82
Integrity management inspection	60
Specialized inspection	46
Standard inspection	244

Inspection types:

- **Construction inspections –** field and record review of pipeline construction and testing.
- **Integrity management inspections –** review the operator's integrity management program, which includes steps taken by the operator to minimize threats to the pipeline system.
- **Specialized inspections –** follow-up to know pipeline concerns or specific areas of code compliance.

[209] Minn. Stat. 299F adopts these regulations for intrastate pipeline companies and provides MNOPS with statutory authority for inspection and investigation.
[210] Companies transporting oil and refined petroleum products are required to comply with Title 49 Code of Federal Regulations, Part 195 – Transportation of Hazardous Liquids by Pipeline and Part 199 – Drug and Alcohol Testing.
[211] Title 49 United States Code, Section 60102
[212] MNOPS data generated October 26, 2015

- **Standard inspections –** include review of operations and maintenance plans, field and records inspections, control room inspections, follow-up to safety related condition reports, operator qualification programs, drug and alcohol programs, and public awareness plans.

Accidents are also investigated by MNOPS. In the event of a pipeline accident, inspectors work with pipeline companies and emergency responders to minimize damage to lives, property, and the environment. In the case of an *interstate* pipeline accident, MNOPS conducts investigations on behalf of PHMSA.

During the response to an accident, the first concern is whether the pipeline operator is making the area safe. These measures include the shut-down of pumping stations and isolation of the damaged section with designated emergency valves. The investigation continues with inquiry into the cause of the release and a plan of action for repair and start-up of the line. Pipeline operators are required to investigate the cause of the release and minimize the possibility of recurrence. Since 1994, MNOPS has investigated 261 crude and refined oil-product pipeline accidents. The table below summarizes all reportable incidences since 2004.

Table 13: PHMSA hazardous liquid incident data (2004-2014)[213]

Year	Number	Fatalities	Injuries	Property damage	Gross barrels spilled	Net barrels lost (unrecovered oil)
2004	5	0	0	$1,622,951	1016	997
2005	3	0	0	$77,530	504	500
2006	8	0	0	$5,481,317	3,240	1,466
2007	6	2	0	$3,016,785	340	326
2008	7	0	0	$708,192	1,622	104
2009	11	0	0	$4,280,517	5,050	2,596
2010	12	0	0	$3,127,737	4,793	4,547
2011	3	0	0	$15,844	10	0
2012	11	0	0	$2,435,828	1,484	372
2013	12	0	0	$1,231,237	61	16
2014	10	0	0	$3,570,840	54	3.5
Totals	**88**	**2**	**0**	**$25,568,778**	**18,174**	**10,928**
2015 YTD	5	0	0	$3,005,138	30.3	2.5
3-year average (2011-2014)	11	0	0	$2,412,635	533	130.5
5-year average (2010-2014)	9.6	0	0	$2,076,297	1,280	988

[213] Table extracted from: http://www.phmsa.dot.gov/pipeline/library/data-stats Report generated on: 10/26/15

In addition to PHMSA, Minnesota Statutes Chapter 115E requires all facilities and companies handling oil and hazardous substances to take reasonable steps to prevent spills. In practice, the other agency implementing 115E, the MPCA, has not asserted authority over pipeline construction, operation, or maintenance. The MPCA considers compliance with federal regulations to be a reasonable prevention step. Transportation companies that are out of compliance with federal prevention regulations are also considered to be out of compliance with Minnesota's law.

Company inspections

Regulations require many operations and maintenance[214] activities to maintain safe operation, and pipeline operators are required to have operations and maintenance procedures for carrying out these activities, including record keeping, ensuring compliance with regulations, responding to emergencies, and abnormal pipeline operations. The operations and maintenance manual defines procedures for preventing accidental ignition, pipeline signage installation, maintenance of firefighting equipment, and other items as noted below:

Table 14: Common pipeline operations and maintenance functions[215]

Required operation and maintenance	Frequency required
Inspection of pipeline rights-of-way	26 times per year (intervals not exceeding three weeks)
Inspection of navigable water pipeline crossings	Every five years
Maintenance of valves used for safe operation	Two times per year (intervals not exceeding 7 ½ months)
Inspection of breakout tanks	One time per calendar year (intervals not exceeding 15 months)
Monitoring of pipeline corrosion protection levels (cathodic protection)	One time per calendar year (intervals not exceeding 15 months)
Monitoring of corrosion protection equipment (rectifiers)	Six times per year (intervals not exceeding 2 ½ months)
Inspection of buried pipelines for corrosion	Any time the pipeline is exposed
Inspection of aboveground pipelines for corrosion	One time every three calendar years (intervals not exceeding 39 months)

High-population areas and navigable waterways in environmentally sensitive areas are defined as high consequence areas. Pipelines in high consequence areas are required to be covered by integrity management plans[216] which are used to assess the integrity of the pipeline system. Pipeline operators analyze data on specific pipelines to identify potential threats to the integrity of the lines. They obtain data from records on construction, leak history, and inspections. General industry data is considered, as well. Pipeline anomalies such as dents, gouges, cracks, and corrosion are revealed during integrity work. Pipeline companies address these issues by reducing pressure or digging up the pipeline and making repairs.

Pipeline pressure-test data and design pressure information are used to define the pipeline's maximum operating pressure to be used in daily pipeline operation to avoid safety issues, leakage, or failure. Pressure-testing regulations require 125% of the maximum operating pressure and include visual

[214] §195.402 Procedural manual for operations, maintenance, and emergencies.
[215] Title 49 CFR Part 195
[216] §195.452 Pipeline integrity management in high consequence areas.

inspections for leaks under test pressure. In cases where pipeline is not visually inspected, an additional four-hour test at 110% of the maximum operating pressure is required. Pressure tests generally employ water as the test medium instead of fuel or other hazardous materials in the line. Pipelines are designed to allow the use of in-line inspection tools called "pigs." Pigs are run through a pipeline to clean it or assess the integrity of a pipeline system. Design regulations also set standards for leak detection and for the design and construction of breakout tanks, all of which are inspected by pipeline companies as well as the state office of pipeline safety.

Regulations require steel pipelines to be coated and electrically protected from corrosion. Cathodic protection is a technique used to control metal pipeline corrosion by making the surface the cathode of an electrochemical cell. These systems require routine maintenance and monitoring – operations required by law to be carried out by qualified personnel trained under a qualification program to perform specific tasks affecting day-to-day operation of the line. Corrosion on pipelines can compromise the integrity of the line by reducing the thickness of the pipe wall, which can eventually lead to a leak or rupture.

Pipeline abandonment and exposure

Pipeline requiring abandonment must comply with regulations on operation and maintenance. Regulations require the pipeline to be safely disconnected from the system, and sealed to maximize safety and minimize environmental hazards. Pipelines are generally purged of product and filled with an inert gas like nitrogen. State regulations require abandoned pipelines to be mapped by the operator, and located and marked when excavation takes place.

Pipelines that may become exposed must be inspected by the pipeline company for corrosion or damage. Regulations do not require the pipeline to be moved, but specific regulations apply when pipe relocation is necessary.

Enforcement

Pipeline operator compliance with regulations is verified by inspections or investigations, and in the event of non-compliance of an intrastate pipeline, an enforcement action is issued by MNOPS. PHMSA officials decide the appropriate course of action with regard to non-compliance on interstate lines. Generally, enforcement actions include:

- A citation of the applicable regulation
- Evidence regarding the non-compliance
- A compliance order designed to ensure future compliance
- A proposed monetary civil penalty, if applicable

Additionally, federal regulations govern penalty amounts for interstate pipelines. Federal penalty amounts may not exceed $200,000 for each violation and not exceed $2 million for a series of related violations. Since 1994, MNOPS inspectors have cited 582 violations of Title 49 CFR Part 195.

Intrastate pipeline violation penalty amounts are covered by Minnesota state statute. Penalty amounts may not exceed $100,000 for each violation and not exceed $1 million for a series of related violations.

Education and public awareness

Pipeline public awareness and damage prevention programs are operator activities required by law. The programs educate the public, government agencies, contractors, and responders on Minnesota's pipeline system, hazards, indications that a release may have occurred, and appropriate response to an incident.

Pipeline companies must provide continuous training for pipeline emergency-response personnel[217] and pipeline employees undergo written examinations and assessments, [218] and participate in hands-on training[219] before performing independently.

MNOPS is the education and enforcement authority for the "Call Before You Dig" law, Minnesota's excavation safety law. The law requires any individual or company to call the Gopher State One Call Center before digging so that pipeline and utility operators can be notified to mark underground utilities. This process saves lives and minimizes excavation damage to pipelines. Excavation damage is a threat to pipelines throughout Minnesota. When excavation equipment operators strike pipelines, the impact can cause dents, gouges, or ruptures on the line. Damage can be potentially devastating. Minnesota statutes currently define "excavation" as a mechanical method of digging. Even though hand digging is exempt from current law, instances occur where digging with a shovel or driving stakes into the ground damages pipeline facilities.

Preparedness plans

State requirements for response preparedness

In contrast to strong federal preemptions for pipeline accident and spill prevention, there are no federal preemptions for state spill response oversight or preparedness planning.

Minnesota Statutes Chapter 115E was passed in 1991 making companies handling oil and hazardous substances responsible for preparing and responding to spills. Pipeline companies are required to have Prevention and Response Plans[220] that show how they are prepared for a worst-case spill. [221] Other types of facilities are required to have plans as well.

State required prevention and response plans must include:

- Spill/release prevention
- Roles within the company for response, coordination with other responders
- Potential spills, worst case spill
- Actions that will be taken if a spill occurs
- Means to procure and deploy equipment and personnel
- Sensitive areas that may be affected and will need protection
- Training and drills

The statute does not include specific standards on how much equipment and response personnel a pipeline or other facility must be capable of delivering and deploying for a spill, nor how quickly that deployment must be done.

The statute identifies the Minnesota Pollution Control Agency as the agency responsible for reviewing a company's preparedness to protect the environment before or after a spill occurs. The

[217] Title 49 CFR Part 195
[218] §195.505 Qualification program
[219] §195.403 Emergency Response Training
[220] Minn. Stat. section 115E.04
[221] Minn. Stat. sections 115.03 and 115.04

statute also identifies the Department of Public Safety as having the authority to review a company's preparedness to protect the public's safety.

MPCA's reviews of other prevention and response plans revealed some common concerns:

- Often the spill safeguards, at facilities are not well described in an overall company plan or are absent at a facility.
- Drainage patterns and waters that will receive spills and residues are often not well described or planned.
- Training for response duties of key company people and positions is often not well described.
- Sensitive areas near a facility are often shown on a map, but seldom are there pre-planned responses to protect those areas.
- Contractors and other non-company responders and equipment are often listed in a plan without evidence that arrangements have been made.
- Time for notification, mobilization, travel, and deployment of response equipment and responders is often unrealistically optimistic.

While Minnesota Statutes Chapter 115E gave authorities to the MPCA and DPS, it was done so without additional funding. As a result, industry prevention and response plans have only been sporadically reviewed over the years by MPCA's emergency response staff. When preparedness has been reviewed, the MPCA has occasionally ordered poorly prepared companies to obtain equipment or training or otherwise improve preparedness. It is common in a pre-spill plan review that the MPCA reviewer finds that some preparedness component needs improvement. In a few cases, the MPCA has called unannounced drills to test a company's preparedness and as a result the company demonstrated deficiencies and was required to make improvements. As necessary, the MPCA may use its enforcement authority to issue field citations with penalties[222] capped at $2,000 or Administrative Penalty Orders[223] with penalties capped at $20,000 for companies that fail to meet their preparedness obligations.

Federal requirements for response preparedness

Federal regulations promulgated under the Oil Pollution Act[224] of 1990 require extensive oil spill response planning and preparedness for some types of facilities like oil cargo vessels and railroads and pipelines.

Contrastingly, other federal entities such as the U.S. Coast Guard[225] and the U.S. EPA[226] regulations for ships, barges, refineries, and many large storage tanks have detailed requirements for equipment, staffing, training, organization, and other aspects of preparedness for large spills. The regulations also identify the amount of response equipment and staffing, and the timelines by which the equipment must be deployed and operating. However, no such detail has been promulgated on the federal level for railroads or pipelines.

Pipeline operators are required to submit a response plan to the Pipeline and Hazardous Materials Safety Administration. [227]The response plan must address a worst-case discharge, identify environmentally and

[222] Minn. Stat. 116.073
[223] Minn. Stat. 116.072
[224] U.S.C. Title 33, Chapter 40
[225] CFR Title 33, Parts 154 and 155
[226] CFR Title 40, Part 112
[227] 49 CFR 194.101

economically sensitive areas, and describe the responsibilities of the operator and others in removing such a discharge. These regulations are not prescriptive, rather they identify timeframes, or tiers, ranging from 6 to 60 hours, for which the company must have equipment and responder at the spill site. This allows for individual companies to determine its response.

After the 2010 rupture of the Enbridge pipeline 6B which released 1.15 million gallons of crude oil to Talmadge Creek, a tributary to the Kalamazoo River in Michigan, the National Transportation and Safety Board (NTSB) reviewed the federal program for pipeline spill response planning and preparedness. [228] The NTSB concluded that PHMSA's regulatory requirements for response capability planning are not as stringent as those of the Coast Guard and the EPA. The NTSB concluded that without specific federal spill response preparedness standards, pipeline operators do not have response planning guidance for a worst-case discharge.

Emergency response

Pipeline operators must, and local emergency responders may call the Minnesota state duty officer to make notification of pipeline emergencies. [229] Pipelines are required to report and cleanup spills immediately. State agencies may advise local emergency responders during pipeline emergencies. Public safety is always an immediate concern, followed by the immediate and long term impacts to the environment Reporting requirements

Emergency response actions often occur after a report. Federal pipeline regulations[230] require various reports regarding pipeline infrastructure, accidents, and construction. See "Federal hazardous liquid operator reporting requirements" in the appendix for addition information. The reported data drives inspection, changes to regulation, and investigation in the case of an incident. Additionally, under Minnesota Statute Section 115.061 any person, facility, or company that has a spill of a material that might cause pollution is required to report the incident to the Minnesota state duty officer. The statute specifies a five-gallon threshold for some types of petroleum spill reporting.

Public safety response

State emergency response

Protecting public safety in the event of a pipeline incident is not extensively evaluated in this report. Under legislation passed in 2014, the commissioner of the department of public safety is required to submit a report on emergency response preparedness for incidents involving transportation of oil. [231] The report titled "Minnesota's Preparedness for Oil Transportion" was released in January 2015. [232]

The following are key findings of the report:

- Minnesota takes an all hazards approach to emergency preparedness: state and local planners consider potential threats, risks, and hazards and plan accordingly. Under state and federal law, Minnesota has a comprehensive framework that would apply to an oil transportation incident. Railroad and pipeline companies are ultimately responsible for responding to an emergency

[228] The NTSB report is available at http://www.ntsb.gov/doclib/reports/2012/PAR1201.pdf
[229] Minn. Stat. section 115.061
[230] Title 49 CFR Part 195
[231] Laws of Minnesota, 2014, chapter 312, article 10, section 11, subdivision 1
[232] The report can be found here: https://dps.mn.gov/divisions/hsem/planning-preparedness/Documents/mn-preparedness-oil-transportation-incident-report.pdf

involving the substances they transport, but local first responders and state agencies also play a role. Minnesota's statutory framework places an emphasis on coordination and collaboration across governments and sectors.

- Capacity to respond to protect public safety in an oil transportation incident involves a combination of components, including equipment, trained personnel, emergency plans, mutual aid agreements, and exercises to test preparedness. The local government mutual aid infrastructure in Minnesota is well developed, and most counties and cities have all-hazard emergency plans that would apply to an oil transportation incident. First responders are relatively unfamiliar with private sector resources and regional response team resources.
- Local governments generally do not have the equipment or personnel to respond to a significant oil transportation incident, such as a large spill or fire. However, local governments are not the primary responsible party for an oil transportation incident—the rail or pipeline company is responsible.
- About half of the first responders surveyed reported that their departments have staff members who have not received training on how to respond to an oil transportation incident, and only about one-third indicated that they had participated in a preparedness exercise in the last two years.
- Additional training is essential for responder preparedness, and survey information indicates that training and preparedness exercises increase perceptions of preparedness. The relatively low level of awareness and familiarity reported by first responders surveyed indicates that awareness-level training is necessary.
- The majority of first responders surveyed said they did not know what additional equipment or resources are necessary to respond to an oil transportation incident.

Other human health considerations

All emergencies have a health component, and the Minnesota Department of Health (MDH) is responsible for ensuring a ready and robust system is in place to prepare for and respond to public health and healthcare emergencies. MDH reports that healthcare professionals lack statewide, consistent standards to follow and they lack legal protections in a crisis such as a pipeline-related mass casualty when there is not enough life-saving equipment or supplies to meet the demand. For example, Minnesota has only 32 licensed burn beds (all in the metro area and all usually nearly full), and transportation of highly flammable fuels by pipeline is increasing dramatically throughout the state. Minnesota lacks support for the state's two specialized "Mobile Medical Teams" that stand ready with staff and supplies to set up acute or long term care in any part of the state to help with a catastrophe, loss of facility, or sudden increase in patients. The current medical reserve corps is underfunded and is often looked to for filling gaps during local responses.

Another important consideration is the need for relocation of long term care and functional needs populations who will be adversely impacted by a pipeline incident. A plan should be in place for the relocation process of evacuated hospitalized, long term care patients, and functional needs populations. The Hospital Preparedness Program (which took a 37% budget cut in July 2014) would be available to assist in the bed tracking process, but capacity in the local regions for planning, training, and exercising has been reduced.

Federal regulatory emergency response requirements

Federal pipeline regulations include specific requirements regarding pipeline emergencies. In addition to regulations noted below, pipeline companies are required to conduct a continuous training for pipeline emergency-response personnel.

§195.402 Procedural manual for operations, maintenance, and emergencies.

(e) Emergencies. The manual required by paragraph (a) of this section must include procedures for the following to assure safety when an emergency condition occurs;

1. Receiving, identifying, and classifying notices of events that need immediate response by the operator, or notice to fire, police, or other appropriate public officials and communicating this information to appropriate operator personnel for corrective action.
2. Prompt and effective response to a notice of each type emergency, including fire or explosion occurring near or directly involving a pipeline facility, accidental release of hazardous liquid or carbon dioxide from a pipeline facility, operational failure causing a hazardous condition, and natural disaster affecting pipeline facilities.
3. Having personnel, equipment, instruments, tools, and material available as needed at the scene of an emergency.
4. Taking necessary action, such as emergency shutdown or pressure reduction, to minimize the volume of hazardous liquid or carbon dioxide that is released from any section of a pipeline in the event of a failure.
5. Control of released hazardous liquid or carbon dioxide at an accident scene to minimize the hazards, including possible intentional ignition in the cases of flammable highly volatile liquid.
6. Minimization of public exposure to injury and probability of accidental ignition by assisting with evacuation of residents and assisting with halting traffic on roads and railroads in the affected area, or taking other appropriate action.
7. Notifying fire, police, and other appropriate public officials of hazardous liquid or carbon dioxide pipeline emergencies and coordinating with them preplanned and actual responses during an emergency, including additional precautions necessary for an emergency involving a pipeline transporting a highly volatile liquid.
8. In the case of failure of a pipeline transporting a highly volatile liquid, use of appropriate instruments to assess the extent and coverage of the vapor cloud and determine the hazardous areas.
9. Providing for a post-accident review of employee activities to determine whether the procedures were effective in each emergency and taking corrective action where deficiencies are found.

Environmental response

Spill recovery and clean-up

Minnesota Statute Section 115.061 also says that anyone spilling a material that might cause pollution is required to "…rapidly and thoroughly recover the spilled material and take all other actions necessary to protect environment and health." MPCA's Emergency Response Team oversees that response and cleanup by the person responsible for the spill. There is no federal pre-emption of state requirements for cleanup of spills. The U.S. EPA also oversees a few major Minnesota incidents within its jurisdiction.

One of the risks to human health and the environment is a large oil spill. From a public safety aspect, this is particularly a concern in highly populated areas and from an environmental aspect, a spill that impacts Minnesota's water resources; especially groundwater which may have drinking water implications is especially concerning. This section describes some of the most important considerations and approaches for an immediate and long term environmental response to an oil spill.

Oil in surface water

Many factors contribute to the spread and spill response efforts of an oil spill to surface waters, including weather, wave action, and the chemical and physical properties of the oil. Oil spilled from pipelines or other sources that reaches surface water spreads on the surface of the water, and consequently, if the water is moving, the oil will move as well. Additionally, wind will spread oil on water and thick layers of oil will spread out and become thinner, more extensive layers.

Some of the oil on water will evaporate. For example, Bakken shale oil is more volatile than many other crude oils. The "light" portion of the oil increases the risk of ignition and therefore the exposure of emergency responders to the toxic volatile components of the oil. Some of the oil on water surface will sink, especially as it mixes with sediment and as it loses the light ends through evaporation. Albert oil sands crude is more prone to sinking than many other crude oils and the sunken oil may move with water and may sink into bottom sediment. It may later release from bottom sediment if disturbed or with changes in temperature or current. Some of the oil will dissolve into the water. Benzene, a toxic component of all crude oil, is among the most soluble components of crude and refined oils. Oil in moving waters will form emulsifications, called oil mousse, which is difficult to recover. Crude oils and refined oils will also have varying levels of hydrogen sulfide and other gases and constituents that are potentially toxic to humans and water life. In addition, oil spilled in surface water will coat emergent vegetation, shorelines, wildlife, structures, and vessels.

Most aspects of an oil spill to surface water are made more difficult and less effective in winter ice and snow conditions. This is especially so if oil gets under ice, or if the ice is not safe for responders and equipment. Sometimes frozen ground or oil on top of competent ice makes oil recovery easier.

Oil that sinks is especially challenging, and tactics for finding and recovering sunken deposits of oil are not well developed. [233] Removal of oiled sediment creates significant damage on its own. Often a point is reached where the environmental damage caused by attempting to recover oil outweighs the damage of the oil. Consequently, oil spill recovery strategy is to get the oil back before it gets away.

Spill response to minimize surface water impacts

Every oil spill recovery tactic requires speedy deployment of specialized equipment by specially trained responders. The tactics of recovery of oil from surface water include:

- Reaching the location of the spill, and reaching downstream of oiled or potentially oiled locations. Access along a railroad track or pipeline right-of-way to the spill site sometimes is easy, but getting access to oil that got away from the spill site down river or into fringing wetlands is often very difficult.
- Stopping the flow of oil from the land into the water with valves, dikes, and pumping up oil from the land before it escapes to water. Each tactic requires access, and much equipment and specialized training.
- Containing oil at the place where it is entering surface water, For example, where an oil-filled ditch is flowing oil to a creek. This is usually attempted with floating containment booms at and downstream of the ditch to hold the oil. Placing containment booms require access and boats,

[233] Development of Bottom Oil Recovery Systems – Final Project Report. Homeland Security. June 2013. Accessed November 29, 2014. http://www.uscg.mil/iccopr/files/Development%20of%20Bottom%20Oil%20Recovery%20Systems%20-%20Final%20Project%20Report.pdf via http://wisconsinwatch.org/2014/03/spill-response-inadequate-for-tar-sands-crude-on-great-lakes/

booms and ropes, anchors, buoys, and specialized training. This equipment is seldom nearby. Containment booms are limited in the amount of oil they will hold back. Containment booms lose effectiveness in water with currents or shallow water.

- Containing oil in ditches and creeks can also be done with diking or underflow dams, each of which takes access and equipment and training.
- Capturing and containing oil downstream of the spill site. Containment typically becomes less effective the further downstream oil travels and the more dispersed oil has become. Downstream capture and containment depends on the currents, weather, shoreline type, and access; and it requires boats, booms, and specialized training. In the best of cases, companies have examined and prioritized potential containment sites in response planning before the spill.
- Skimming, sorbing, or pumping oil from the water's surface. A skimmer is a vacuum or sorbing device that pulls the floating oil layer off of the water. Sorbents are natural or man-made materials that absorb oil but not water. The oiled sorbent must then be recovered from the water for disposal. Vacuum trucks can pump oil from oil pools or thick layers of oil on water. Skimming, sorbing, and pumping oil requires access and equipment and tanks to store recovered oil and eventual disposal.
- Downstream, ahead-of-oil protection of shorelines and sensitive features. Containment boom can be deployed at some sensitive locations before the oil arrives to deflect oil further downstream. Protection measures require careful selection of sites to be protected, since equipment and time does not allow protection of all areas. In the best of cases, sensitive areas have been examined and prioritized in response planning before the spill.
- Mopping up oil that has been stranded on shorelines, wetlands, marinas, structures. This can be done with sorbents, power washers, oil-lifting chemicals, excavation, etc. This is very labor intensive work requiring equipment, access, and specialized training. Some mopping up methods can be destructive of environmental features, for example steam cleaning rocky shores, or moving people and boats through wetlands.
- Sampling water, sediment, shoreline, vegetation etc. to assess where oil or oil components remain in the environment and whether additional recovery is possible and warranted.
- Recovering residual oil from sediments, shorelines, wetlands, and other places as possible.
- Monitoring the ongoing effects of residual oil and of recovery operations.

Groundwater

As oil sinks into the ground, some oil will be absorbed onto the soil particles and may never reach groundwater directly. However, the oil retained on or in the soil will serve as a continuing source of contamination as infiltrating precipitation passes through it and carries the contaminants to the groundwater. Some soils such as clay have small or non-connected pore spaces that oil will not readily pass through it, while soils like sands and gravels have large interconnected pore spaces through which oil will pass readily and quickly. The speed of travel is dependent on the soil type and the viscosity of the oil. Some oils flow readily and are very "liquid" passing through soil quickly; other oils are thick, and move through soil pores slowly.

Factors such as soil type and the viscosity of the oil influence the spill response and clean-up methods.

Spill response to protect groundwater

To protect groundwater from becoming contaminated, selecting response strategies requires understanding the soils and groundwater direction, speed, and other characteristics. The response

strategies use a variety of tools and information to determine the best means to intercept the contamination Classic physical strategies to protect groundwater from spills include:

- Pumping spilled oil from the ground's surface before it sinks into the ground.
- Digging and removing oil-saturated soils so that the oil won't continue sinking into the ground and groundwater.
- Using high capacity blowers to suck the oil out as a vapor from the soil.

Response to groundwater contamination

Unfortunately, even a very aggressive spill response will often not recover all spilled oil from the ground. In those cases, once oil reaches groundwater, strategies for mitigating contaminated groundwater include:

- Installing skimmers and pumps into the oil floating on the groundwater surface to pump out free product.
- Pumping groundwater to draw floating and dissolved oil to the surface for treatment.
- Adding oxygen and other materials to enhance natural degradation of oil.
- Monitoring natural attenuation and biodegradation.
- Ongoing monitoring to track contaminated groundwater behavior.
- Well replacement or treatment of a contaminated well.
- Adding restrictions on drilling new wells in the area.

Historically, the industry practice for "cleaning up" pipeline ruptures was to pump what oil could be pumped, sometimes burn residual surface oil, and dig out near-surface soil saturated with oil. These practices resulted in contaminated sites from historic pipeline leaks. Throughout the 1990s and 2000s, the PCA worked with the pipeline companies to investigate many such historic pipeline spills and completed additional cleanup.

Biodegradation of oil

Oil that cannot be retrieved after a spill will eventually biodegrade over a period of many decades. The rate at which biodegradation occurs is variable and contingent on many factors, including soil types, temperatures, adequate oxygen, and moisture. Likewise, the chemical and physical properties influence biodegradation as some refined oils have additives or other non-biodegradable components.

Dissolved oil at the forward and side of the plume will typically be attacked by indigenous microbes. A steady-state will eventually be reached, and the microbial biodegradation at the forward edge of the plume keeps up with the oncoming oil in the oncoming groundwater. As oil content of the plume is exhausted, this biodegradation consumes most or all of the spilled oil and the plume shrinks. This process is called natural attenuation. Understanding natural attenuation is important in a spill response, but natural attenuation is never accepted as the sole response to any spill.

Evaluating the harm of an oil spill

MPCA and the DNR are "co-trustees" for the state's natural resources. A trustee can prepare a Natural Resource Damage Assessment and Restoration (NRDAR) after an oil spill or a cleanup under state or federal law. The NRDAR is a legal process by which natural resource trustees can recover lost resources and the services provided by those resources, such as habitats or lost recreational use services. The program addresses spills that enter, or have the potential to enter, state surface or groundwater. When these spills affect fish and wildlife or sensitive natural resources, rehabilitation or restoration may be required of the responsible company. In the event of a spill, restitution can be required to compensate for lost fish and wildlife. Minnesota Statutes 97A.341 and 97A.345 allow the Department of Natural Resources to establish restitution values, which were adopted in Minnesota Rules chapter 6133. The values are for lost fish and wildlife based on counts from a field investigation and usually involved game species.

Understanding attenuation

The United States Geological Survey (USGS) manages one of the world's premier oil spill research sites near Bemidji. The research project was a result of an approximately 450,000 gallon spill of crude oil from a pipeline in 1979. Although most of the spill was recovered, excavated, and burned as part of the cleanup, approximately 25,000 gallons of oil remains in the soil and groundwater today.

Researchers from around the country and the world have intensively studied the site since the 1980s. Much of the current knowledge of oil behavior and attenuation in soil and groundwater comes from this Minnesota research. The groundwater plume from this large pipeline spill extends about 500 feet in length and is not migrating or expanding.

More information about the project is at: http://mn.water.usgs.gov/projects/bemidji/

Oil spills in Minnesota

Since recording spills in the 1960s, the MPCA's spill log contains hundreds of reports related to pipelines, from small and slow leaks, large and sudden ruptures, discoveries of historic spills, and storage tank leaks. However, data collected from various state agencies beginning in the 1990s is considered the most accurate. See "Oils spills in Minnesota" in the appendix for a list of operator reported spills over 10 thousand gallons since the 1990s.

The largest pipeline spill in Minnesota in recent decades was a 1.7 million gallon crude oil spill from Lakehead, now called Enbridge line 3, in Grand Rapids in March 1991. Pumping and extensive excavations of wetland was done to recover most of the oil. About 300,000 gallons escaped to the Prairie River. Most of that oil flowed onto the river's ice surface, and was recovered by an aggressive and effective company response. A spill that went beneath the ice, or a spill in a different season, would have been far more challenging to recover and would have caused much greater surface water damage.

While Minnesota has dealt with oil spills, including 80 spills over 10,000 gallons between the 1960 to 2012, it has not seen a spill as large as the one that occurred in Michigan's Kalamazoo River in 2010. Reviewing the happenings and the outcomes of the spill offers valuable insight for the state.

Kalamazoo River crude oil spill information

In July 2010, the Enbridge pipeline 6B, part of the Lakehead system, ruptured releasing over 1.15 million (revised number as of May 2014) gallons of crude oil to Talmadge Creek, a tributary to the Kalamazoo River in Michigan. The crude oil contaminated two miles of Talmadge Creek and almost 36 miles of the Kalamazoo River before being stopped. This was one of the largest on-land oil spills in U.S. history.

The crude oil released was a blend of Canadian heavy conventional and bitumen oil sand crude oils. To get bitumen to flow through a pipeline, it is diluted by about 30% with liquid chemicals or diluents that may include benzene. Once exposed to air, the benzene and other solvents volatilize leaving the heavy bitumen that may sink in water.

Operators received multiple alarms concerning pipeline pressure and volume discrepancies at a control station, but suspected there was an air bubble in the pipe causing the pressure issues. Operators continued several times to restart the pumps forcing more oil into the line to push the bubble out. This may have accounted for up to 80% of the total release. The National Response Center was alerted 17 hours after the rupture was discovered.

The area had just received six inches of rain over several days, and the rivers were flowing at flood stage when the spill began. This made containment with booms difficult at high flows. Local spill responders initially understood that the spill was regular crude oil and responded accordingly rather addressing the unique consistency and nature of the product. Enbridge did not initially communicate the type of oil spilled clearly to responders.

Residents living along Talmadge Creek and the Kalamazoo River complained of a foul stench causing dizziness and headaches as the crude oil flowed past. Benzene readings taken with hand-held monitors ranged from 50 ppb to 3,000 ppb. Local responders decided to evacuate people from their homes if benzene was found in concentrations greater than 200 ppb. Later, more sophisticated monitors found a wide range of benzene readings from 50 ppb to 10,000 ppb.

The Kalamazoo River, a tributary to Lake Michigan, was considered a wild and natural river after many years of improvements due to the Clean Water Act. It was not a drinking water source. However, Lake Michigan is a drinking water source. The EPA prioritized stopping the flow of the oil before it could reach Lake Michigan.

As the unrecovered oil was transported downstream within the water column, a portion of it incorporated suspended sediments, causing it to sink until it eventually moved from the suspended sediment load to submerged oil. The mixing of the crude oil and the suspended sediment occurred as a result of the turbulent flow within the river channel. When the crude oil that had been driven into the water column reached the river bottom, it formed marble sized tar balls that were swept along the river bottom with other detritus. These tar balls would settle out in low-flow areas.

To clean up the tar balls, a plan was devised to allow the tar balls to settle out in three areas where dams were located. These areas would be repeatedly dredged to remove the contaminated sediments and tar balls. Other areas along the river, such as backwater wetlands and floodplain were left oiled when waters receded. These areas were then cleaned using more conventional methods of booms, skimmers, and vacuum trucks.

It is notable that the British Petroleum Deepwater Horizon spill occurred approximately 3 months earlier than the Kalamazoo River spill. Federal agency personnel and equipment were sent to assist with the Deepwater Horizon spill, resulting in less available resources for assistance with the Kalamazoo spill than would normally be available.

Economics of the Kalamazoo pipeline spill

Spills can lead to business closures, loss of employment, short and long term health costs, destruction of property, and damage to difficult to monetize amenities (e.g., biodiversity, air quality). Assessing the economic risk of a substantial spill on Minnesota is vital, but difficult. Each spill involves unique factors such as magnitude, population density, industry mix, and ecosystem vulnerability. [1]

Given the lack of clarity on the topic, examining an extreme case can give us clues on how a pipeline burst or rupture can affect an economy. In July 2010, a pipeline ruptured near Marshall, Michigan, resulting in Alberta oil sands heavy crude oil pouring into the Kalamazoo River and its tributaries. [2] The owner of the pipeline, Enbridge Energy Partners, spent $1.21 billion over four years for emergency response, environmental remediation, cleanup activities, and third-party claims. [3] Likely, the total cost of the disaster is higher as some expenses, including ongoing air and water monitoring, medical expenses related to exposure, property value decreases, administrative costs, and job loss, are not included in that total paid by Enbridge.

Newspaper reports and resident statements provide anecdotes of the effects on tourism and groundwater. Thirty-six miles of the Kalamazoo were closed for nearly two years, preventing tourism related to fishing, kayaking, and camping. Interviews conducted by the EPA noted community frustration in "economic losses for businesses associated with these activities." [4] Residents also expressed a concern about groundwater testing and its impact on community health and businesses (including a local wheat mill).

The impact of the spill on the local property market is also unclear. Enbridge purchased 150 residential properties located within a 200-foot "red zone" of affected waterways. [5] Residents outside the zone are unsure how the stigma of the spill will change property values. Concerns exist that Enbridge could hurt property values by releasing all the homes it purchased at the same time—flooding the local property market. In December 2014, Enbridge and landowners agreed to settle a class action lawsuit—pending approval from a federal judge— for $6.8 million. The funds will compensate land owners, fund a well-water sampling program, reimburse spill expenses, and pay for conservation efforts. [6] Additional litigation from other affected parties is pending.

The spill also had negative impacts on non-market "amenities" such as air quality, natural beauty of the wilderness, and diversity of animal species. Though hard to quantify, these amenities have economic value. For example, the spill released noxious chemicals in to the air, water, and soil. Air-quality monitors found elevated benzene levels during the first week of the spill, leading to temporary illnesses in some residents. [7] Area medical centers reported over 120 visits related to illnesses from the spill (both a direct cost and amenity cost). [8]

The spill also had obvious negative impacts of animal populations—the Michigan Department of Natural Resources recovered more than 3,000 turtles, 170 birds, and 40 mammals that were dead or injured. [9]Though many of animal populations have begun to recover, tree removal and dredging has permanently altered their habitat—the river is now wider, shallower, and more algae-filled. The state of Michigan, U.S. Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration are conducting a natural resource damage assessment to determine if Enbridge should pay for addition restoration and compensate the public for loss enjoyment of natural resources.

Reviewing examples like Kalamazoo gives valuable information about the potential risk of pipelines. Unfortunately, the economic impacts of these events are not well studied and, even if they were, individual incident context is important to the size and characteristics of the impact.

[1] In McLaughlin, R. S. (2014). Transporting Crude Oil by U.S. Rail: Background, Issues, and Trends. *Congressional Research Service.* p. 36. Retrieved from http://fas.org/sgp/crs/misc/R43390.pdf
[2] EPA's Response to the Enbridge Oil Spill. (2014). *Environmental Protection Agency*. Retrieved from: http://www.epa.gov/enbridgespill/
[3] Ellison, Garret. (2014, November 5). New Price Tag for Kalamazoo River Oil Spill Cleanup. *MLive.com*. Retrieved from: http://www.mlive.com/news/grand-rapids/index.ssf/2014/11/2010_oil_spill_cost_enbridge_1.html
[4] Community Involvement Plan: Enbridge Oil Spill. (2011, July 11). Prepared for the *Environmental Protection Agency by Weston Solutions, Inc.* Retrieved from: http://www.epa.gov/enbridgespill/pdfs/enbridge_cip_20110811.pdf
[5] Ibid; How Do Pipeline Spills Impact Property Values? (2013, December). *Conversations for Responsible Economic Development.* Retrieved from: http://credbc.ca/wp-content/uploads/2013/12/Pipeline-spills-property-values.pdf; Research found limited information about the terms of these purchases, how the purchased property will be used going forward, or affect local property tax revenues.
[6] Ibid.
[7] Enbridge Oil Spill Daily Update. (2010, 12 August). *Calhoun County Public Health Department.* Retrieved from: http://www.epa.gov/enbridgespill/pdfs/enbridge_ccphd_update_20100812.pdf
[8] Enbridge Pipeline Oil Spill in Marshall, Michigan: Hearing Before the Committee on Transportation and Infrastructure, House of Representatives, 111th Congress 2. (2010, September) (Testimony from Mark Schauer). Retrieved from: http://www.gpo.gov/fdsys/pkg/CHRG-111hhrg58236/html/CHRG-111hhrg58236.htm
[9] Matheny, K. (June 2013). Three Years after Oil Spill, a Slow Recovery Haunts Kalamazoo River. *Detroit Free Press.* Retrieved from: http://www.freep.com/article/20130623/NEWS06/306230059/Kalamazoo-River-oil-spill

Findings and considerations

Preparing for a potential worst-case event involves many different activities; planning, coordination, training and implementation. Emergency responders must be well informed of pipeline industry activities and ensure the preparedness of potentially impacted communities to manage any type of crude oil pipeline-related incident.

Preparedness

- Minnesota Statutes Chapter 115E has required specific spill preparedness and planning for any facility that transports, stores, or otherwise handles hazardous substances or oil, including railroads that handle more than 100,000 gallons of oil per month. The original Chapter 115E language was performance based, for example, "must prevent spills" and must be prepared to handle spills, and not specific or detailed.

  The language was not prescriptive or detailed as to how much equipment must be delivered to a spill site within any particular timeframes. Consequently, this should be changed to include deployment times for monitoring equipment and oil containment equipment equal to requirements of the railroads. Additionally, the U.S. Coast Guard and the U.S. EPA regulations for ships, barges, refineries, and many large storage tanks have detailed requirements for equipment, staffing, training, organization, and other aspects of preparedness for large spills. Included in the regulations are the amount of response equipment and staffing, and the timelines by which the equipment must be deployed and operating. PHMSA does not have equal requirements of pipelines.
- A lot can be gained from local and state plan reviewers and responders evaluating spill response preparedness. The agencies charged with administering Minnesota Statutes Chapter 115E have not been given resources to do so. The 2014 Legislature provided funding for one position to work with railroad unit train response preparedness and planning. Specifically allocate funds to staff to review pipeline response plans and preparedness before spills occur should be considered

Prevention

- Removing spilled oil from Minnesota's water resources is especially difficult and never has all the oil spilled been recovered. Preventative measures and preparedness are the best ways to reduce the risk of spills. Shut-off valves are currently required on both sides of rivers greater than 100 feet in width. Assessment should be made of all water and stream crossings with calculation of potential drain-back to a crossing site rupture from both sides of the crossing. Assessment should include whether additional valves might actually increase spill frequency, since valves can be a vulnerable portion of a pipeline system.
- A "breakout tank" is an aboveground storage tank which receives and delivers oil to and from a pipeline. Breakout tanks may be many million gallons in capacity. Breakout tanks are preempted from state regulation. Federal pipeline regulations require breakout tanks to comply with various industry standards for construction, operation, and maintenance. The regulations require a dike, called secondary containment, to surround a breakout tank. But federal regulations have no design criteria for "tightness," or ability of a secondary containment area to keep a spill from soaking into the ground. Some pipeline breakout tanks in Minnesota are placed on permeable soils that could not contain a spill.

  Minnesota regulation for all other storage tanks includes the requirement that each above ground tank be surrounded by a "tight" secondary containment structure. Tight secondary containment will prevent the spill from escaping the facility into surface water or soaking into the ground and

contaminating groundwater. Minnesota should urge PHMSA to require tight secondary containment around breakout tanks.

Emergency response

- All emergencies have a health component. This topic is not thoroughly reviewed in this report, and therefore more research and a greater evaluation of the readiness of Minnesota' health system to address a pipeline-related mass casualty event may be necessary.

  The following should be included in any future evaluations:

  - Address the readiness of the Hospital Preparedness Program in the state which would be available to assist in the bed tracking process, but capacity in the local regions for planning, training, and exercising has been reduced.
  - Review logistical needs such as the relocation of long term care and functional needs populations who will be adversely impacted by a pipeline incident and issues such as the amount and availability licensed burn beds in the state.
  - Address how the lack of support for the state's two specialized "Mobile Medical Teams" that stand ready with staff and supplies to set up acute or long term care in any part of the state to help with a catastrophic event will impact a response.
  - Address the role of healthcare professionals, which lack consistent standards to follow and legal protections in a crisis such as a pipeline-related mass casualty event when there is not enough life-saving equipment or supplies to meet the demand.
- Federal pipeline regulations, created as part of the Hazardous Liquid Pipeline Safety Act of 1979, are minimum safety standards. Operators may choose to go above and beyond the regulatory requirements. While federal preemptions may apply to pipeline safety, there is no preemption of spill preparedness, response planning, response, or spill cleanup it is the responsibility of all stakeholders involved. Industry, regulators, emergency responders and the public all impact pipeline safety in Minnesota. As a result to be assured that resources and equipment are readily available for a response; Companies should be working with each other and with state agencies to strategically locate caches of equipment and cadres of trained responders and work towards equipment cooperatives and mutual aid. This cooperation should include response resources that are shared with communities and other industries, such as railroads or refineries.

Evaluating the harm of an oil spill

- In the event of a spill, restitution can be required to compensate for lost fish and wildlife. Minnesota Statutes 97A.341 and 97A.345 allow the DNR to establish restitution values, which were adopted in Minnesota Rules 6133. The values are for lost individual fish and wildlife based on counts from a field investigation and usually involves game species. Extending the statute to consider restitution for nongame species (other than threatened/endangered), should be explored. This is already occurring to some extent as nongame species are addressed through required habitat restoration efforts.

  NRDAR goes beyond the fish and wildlife restitution program. NRDAR considers all of the injuries to the natural resources affected by a spill, and seeks compensation, restoration, or replacement of those injured natural resources and the services those resources provide. There should be additional guidance on how to establish dollars or restoration values on groundwater. The valuation of injured surface and groundwater resources presents challenges under the NRDAR process. Groundwater injury is especially difficult to place a dollar or restoration value

on including valuing groundwater for potential future use, and the use of groundwater in remediation efforts is increasingly imposing limitations on other existing and prospective groundwater users in some areas.

Summary of public comments

During public review of this report, some spill prevention, preparedness, emergency response and safety-related comments received expressed the following:

- Spill response planning comparisons between rail and pipelines is not relevant
- Mention the existence of pipeline leak detection systems and methods.
- Request a guarantee that oil pipeline companies would be responsible for all costs associated with a spill
- Outline a more realistic process for assessing spills and a more robust structure for regulating spill response
- More information is needed on the potential impacts of oil spills and pipeline ruptures

More study needed

Spill prevention, preparedness, emergency response and safety-related issues identified for more study include:

- Better understanding of implications for applicability of financial assurance requirements for crude oil pipelines projects

Appendices

Agency roles in pipeline oversight

Public Utilities Commission (Commission)

The Commission manages state oversight of proposals to construct or modify large energy facilities in Minnesota, which includes gas and petroleum facilities. The Commission's jurisdiction may include a state Certificate of Need and/or a state site or route permit. Applications or joint applications for projects subject to the Commission's jurisdiction must be filed in compliance with state statues and administrative rules. The Commission's procedures for review of proposed large energy facilities incorporate compliance with the Minnesota Environmental Policy Act and provide public participation. Jurisdiction over siting and routing permits was transferred by 2005 legislation from the Minnesota Environmental Quality Board to the Commission[234]. While the Commission is the ultimate decision-maker on petitions for certificates of need[235] and routing or siting dockets, certain environmental review procedures are the exclusive jurisdiction of the Minnesota Department of Commerce.

Department of Commerce, Division of Energy Resources (Commerce-DER)

The main role of the Commerce-DER is to represent the public interest in proceedings before the Commission by ensuring that the general public's long term interests are represented when utilities under the Commission's jurisdiction propose to change their rates, services, or facilities. This is done in two ways: first, Commerce-DER analyzes utility filings to ensure that the filing company has complied with all applicable rules and statutes and with any stipulations required in past Commission orders. Secondly, the Commerce-DER assists in assessing utility filings while building a complete record when utilities request permission for rate increases, construction of new facilities, changes to tariffs, or any other actions that require Commission approval under statutes or rules. Under either function, the Commerce-DER provides the Commission with a recommendation on what action should be taken based on its analysis of the utility's filing and the information in the record.

Minnesota Department of Commerce, Energy Environmental Review and Analysis (Commerce-EERA)

Commerce-EERA conducts the environmental review required for energy facilities for which Commerce is the responsible unit of government. As requested by the Commission, Commerce-EERA conducts environmental review for pipeline projects. Commerce-EERA provides technical analysis to the Commission, including analysis of the relative merits of pipeline routing options and identification of permit conditions to mitigate potential impacts. Commerce-EERA also assists the Commission by providing analysis of permit compliance filings and recommendations regarding these filings.

Minnesota Environmental Quality Board (EQB)

The Minnesota Environmental Policy Act[236] established the EQB[237] to implement the act, promulgate rules[238], develop policies, create long-range plans, and review proposed projects that would significantly

[234] 2005 Session Laws, Chapter 97, Article 3.
[235] Minn. Stat. § 216B.243, Subd. 2
[236] See generally Minn. Stat. § 116D.04
[237] Minn. Stat. § 116C.01 (1973). The year before an Executive Order established the Environmental Quality Board to coordinate the many agencies involved in environmental efforts.

influence Minnesota's environment. Specifically, regarding environmental review, MEPA and the board seek to avoid and minimize damage to Minnesota's environmental resources caused by public and private actions. This is accomplished by requiring certain proposed projects to undergo special review procedures prior to obtaining approvals and permits otherwise needed. Pursuant to 4410.3600, the EQB approved an alternative review process for pipeline routing in 1989. While environmental review is not an approval process, it is an information gathering process to help governmental units with permitting and making informed decisions that carry out the protection measures identified in environmental review.

Minnesota Department of Natural Resources (DNR)

The DNR permits activities encountered with pipeline development; is a substantial land owner and land administrator along pipeline routes, and reviews pipeline projects for impacts to natural resources. The agency reviews and comments on projects in order to meet statutory obligations developed to ensure natural, recreational, and cultural resources are protected. The DNR has jurisdiction over wildlife in Minnesota and administers the Minnesota outdoor recreation system, [239]including wildlife management areas, scientific and natural areas, state parks, state forests, state recreation areas, and other DNR managed lands. The DNR Lands and Minerals Division (LAM) coordinates reviews for utilities that cross state or public land and issues licenses to cross public waters and state lands managed by the DNR. The DNR also issues water use (appropriation) permits from when users withdraw more than 10,000 gallons of water per day or one million gallons per year, usually during pipeline construction. Prior to pipeline construction, surveys for rare species may be required in order to determine if the proposed project would result in a taking of endangered or threatened species under Minnesota endangered species law[240] and therefore would require a permit from the DNR.

The DNR Natural Resources Damage Assessments program addresses spills that enter, or have the potential to enter, state surface or groundwater. When these spills affect fish and wildlife or sensitive natural resources, rehabilitation or restoration may be conducted by the responsible company.

Also, in the event of a spill, restitution can be required to compensate for lost fish and wildlife. Minnesota statutes 97A.341 and 97A.345 allow the department to establish restitution values, which were adopted in Minnesota rules chapter 6133. The values are for lost fish and wildlife based on counts from a field investigation and usually involved game species. Natural Resource Damage Assessment and Restoration (NRDAR) is a legal process by which natural resource trustees can recover lost resources and the services provided by those resources, such as habitats or lost recreational use services.

Minnesota Pollution Control Agency (MPCA)

The MPCA monitors environmental quality and enforces environmental requirements in accordance with applicable Minnesota rules and statutes. Environmental rules and statutes set standards for environmental quality and limits on pollutants that can be emitted and/or discharged from facilities and construction work. The MPCA regulates air emissions, hazardous and solid waste, above- and underground storage tanks, and water quality, including point source, nonpoint source, and construction and industrial stormwater discharges. The construction, installation, and operation of pipelines, tank terminals, and refineries may require MPCA permits for air quality, aboveground storage tanks, wastewater, industrial stormwater, construction stormwater, and Section 401 Water Quality Certification. Additionally, the MPCA is responsible for the environmental review of large storage facilities for hazardous materials,

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[238] Minn. Rules Chapters 4405 and 4410
[239] Minn. Stat. § 86A and § 84.027, subd. 2
[240] Minn. Stat. § 84.0895

including storage of crude oil, oil products, and chemicals in tanks or rail cars. The mandatory environmental assessment worksheet threshold is one million gallons at a facility. MPCA is responsible for overseeing oil spill recovery and cleanup, spill preparedness and is a co-trustee implementing the Natural Resource Damage Assessment and Rehabilitation.

Minnesota Department of Transportation (MN DOT)

MN DOT develops and implements policies, plans and programs for aeronautics, highways, motor carriers, ports, public transit, railroads and pipelines. It provides a balanced transportation system with a mission to maximize human health, the environment and the state's economy. The agency plans, builds, operates and maintains a safe, accessible, efficient and reliable transportation system that connects people to destinations and markets throughout the state, regionally and around the world.

Minnesota Department of Health (MDH)

MDH is the state's lead public health agency, responsible for protecting, maintaining and improving the health of all Minnesotans. Relative to oil pipelines, MDH regulates public drinking water, construction and abandonment of wells, and asbestos abatement.

Minnesota Department of Agriculture (MDA)

In 2005, MDA was expressly given the responsibility[241] over mitigation measures for agricultural impacts related to pipeline projects. With this responsibility, the commissioner may participate and advise the Commission as to whether to grant a permit for the project and the best options for mitigating adverse impacts to agricultural lands if the permit is granted. Moreover, MDA is the lead agency on the development of any agricultural mitigation plan required for the project.

Minnesota Board of Water and Soil Resources (BWSR)

BWSR is the state agency responsible for promulgating the Wetland Conservation Act rules and oversight of local government units' (LGU) implementation activities. For activities that affect wetlands in more than one LGU, BWSR may coordinate the project review to ensure consistency and consensus among the LGUs involved[242]. Projects associated with pipelines often cross multiple LGUs, and in these instances, BWSR staff will typically coordinate the review of submitted materials and decisions on applications among the affected governments.

Minnesota Department of Public Safety (DPS), Minnesota Office of Pipeline Safety (MNOPS)

DPS has four divisions that would engage in the event of a Minnesota pipeline spill or other incident. The Minnesota State Patrol, State Fire Marshal Division, Homeland Security and Emergency Management Division, and Minnesota Office of Pipeline Safety have roles in the response and investigation in such an event. DPS divisions are engaged in the inspection, incident investigation, incident response, and emergency response preparedness training related to the safe operation of pipelines in Minnesota. MNOPS has been certified since 1991 to inspect both *interstate* and *intrastate* pipelines under authority of the U.S. Department of Transportation-PHMSA. MNOPS personnel inspect pipeline facilities and investigate pipeline accidents and incidents.

[241] Minn. Stat. § 216B.243 and 216E.10
[242] Minn. Rule 8420.0200, Subp.1, Item F

Department of Revenue (DOR)

The DOR manages the state's revenue system and administers state tax laws. Property tax, sales and use tax, and corporate franchise tax have the most direct impact on pipeline companies transporting crude oil and refined petroleum products in and through the state. For property tax purposes, the DOR performs annual valuations of the oil pipelines and certifies these market values to counties.

Department of Employment and Economic Development (DEED)

DEED is the state's principal economic development agency. DEED facilitates an economic environment to produce jobs and improve the quality of the state's workforce. For this report, DEED has provided an economic analysis of the interconnectedness of crude oil transportation with other industries and commodities, while exploring the economic impacts as a result of the North American oil boom, recent market uncertainty and construction of new pipelines in Minnesota.

Minnesota oil and refine product spills

Pipeline Spills Greater than 10 Thousand Gallons Reported to the MPCA (1996 – 2012). This list does not include spills less than 10 thousand gallons or leaks of unknown volume.

Date (day/month/year)	Reported Spill Volume	Unit	City or County	Company Name	Product
24-Aug-96	420,000	Gallons	DONALDSON	Lakehead	Petroleum, Unspecified
19-Aug-98	51,700	Gallons	Barnesville	Amoco	Gasoline
16-Sep-98	147,000	Gallons	Red Lake	Lakehead	Crude Oil
23-Apr-99	24,000	Gallons	Fergus Falls	Amoco	Gasoline
22-Feb-99	20,000	Gallons	ARGYLE	Lakehead	Other (Described In Remarks)
29-Oct-99	168,000	Gallons	Brooton	Williams	
09-Nov-99	25,000	Gallons	MARSHALL	Williams	Light Fuel Oil and Diesel
22-Jul-00	20,000	Gallons	Leonard	Lakehead	Crude Oil
24-Apr-02	84,000	Gallons	Cottonwood	Williams	Jet fuel
04-Jul-02	252,000	Gallons	Cohasset	Enbridge	Crude Oil
24-Feb-03	100,000	Gallons	MSP airport	MSP airport fuel hydrant	Jet fuel
27-Jun-06	134,400	Gallons	Little Falls	Pipeline	Crude Oil
28-Nov-07	15,000	Gallons	Clearbrook	Enbridge	Crude Oil
23-Mar-08	67,200	Gallons	Clearbrook	Koch Pipeline	Crude Oil
04-Dec-09	210,000	Gallons	Staples	Koch Pipeline	Crude Oil
14-Feb-12	63,000	Gallons	Apple Valley Rosemount terminal	Magellan	Gasoline

Federal hazardous liquid pipeline operator regulatory reporting requirements

The table below outlines federal pipeline operator reporting requirements (Title 49 CFR Part 195)

Hazardous Liquid Pipeline Operator Regulatory Reporting Requirements		
Reporting Requirement	**Purpose**	**Frequency**
PHMSA Annual Report	Pipe Inventory (Size, Mileage, Material, & Vintage)	Annually (Due June 15 Each Year)
	Leaks (By Cause, Hazardous, & Non-Hazardous)	
	Integrity Inspections conducted in the year	
	Repairs made due to integrity inspections in the year	
Telephonic Notice To National Response Center	Release resulting in one or more of the following:	Soon as practicable
	-Release of 5 gallons (19 liters) or more of hazardous liquid or carbon dioxide, except that no report is required for a release of less than 5 barrels (0.8 cubic meters) resulting from a pipeline maintenance activity if the release is:	(within 1 hour)
	(1) Not otherwise reportable under this section;	
	(2) Not one described in § 195.52(a)(4);	
	(3) Confined to company property or pipeline right-of-way; and	
	(4) Cleaned up promptly;	
	-Caused a death or a personal injury requiring hospitalization	
	-Resulted in either a fire or explosion not intentionally set by the operator	
	-Caused estimated property damage, including cost of cleanup and recovery, value of lost product, and damage to the property of the operator or others, or both, exceeding $50,000	
	-Resulted in pollution of any stream, river, lake, reservoir, or other similar body of water that violated applicable water quality standards, caused a discoloration of the surface of the water or adjoining shoreline, or deposited a sludge or emulsion beneath the surface of the water or upon adjoining shorelines	
	-In the judgment of the operator was significant even though it did not meet the criteria of any other paragraph of this section	
PHMSA Accident Report	Formal written report in follow up to an incident meeting the requirements for telephonic notice	Within 30 days of the incident
	The report describes incident details such as:	
	Pipe Parameters involved in the incident	
	Incident Cause as determined by the operator	

Safety Related Condition Report	Reporting of:	Within 5 working days of determination
	(1) General corrosion that has reduced the wall thickness to less than that required for the maximum operating pressure, and localized corrosion pitting to a degree where leakage might result.	
	(2) Unintended movement or abnormal loading of a pipeline by environmental causes, such as an earthquake, landslide, or flood that impairs its serviceability.	No more than 10 working days after discovery
	(3) Any material defect or physical damage that impairs the serviceability of a pipeline.	
	(4) Any malfunction or operating error that causes the pressure of a pipeline to rise above 110 percent of its maximum operating pressure.	
	(5) A leak in a pipeline that constitutes an emergency.	
	(6) Any safety-related condition that could lead to an imminent hazard and causes (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent or more reduction in operating pressure or shutdown of operation of a pipeline.	
General Notification	(1) An operator must notify PHMSA of any of the following events not later than 60 days before the event occurs:	Within 60 Days
	(i) Construction or any planned rehabilitation, replacement, modification, upgrade, uprate, or update of a facility, other than a section of line pipe that costs $10 million or more. If 60 day notice is not feasible because of an emergency, an operator must notify PHMSA as soon as practicable;	
	(ii) Construction of 10 or more miles of a new hazardous liquid pipeline; or	
	(iii) Construction of a new pipeline facility.	
	(2) An operator must notify PHMSA of any following event not later than 60 days after the event occurs:	
	(i) A change in the primary entity responsible (i.e., with an assigned OPID) for managing or administering a safety program required by this part covering pipeline facilities operated under multiple OPIDs.	
	(ii) A change in the name of the operator;	
	(iii) A change in the entity (e.g., company, municipality) responsible for operating an existing pipeline, pipeline segment, or pipeline facility;	
	(iv) The acquisition or divestiture of 50 or more miles of pipeline or pipeline system subject to this part; or	
	(v) The acquisition or divestiture of an existing pipeline facility subject to this part.	


MINNESOTA
EQB
ENVIRONMENTAL QUALITY BOARD