
CLOSING ENBRIDGE'S LINE 5 PIPELINE

WHAT ARE THE
OPTIONS AND
ALTERNATIVES
AVAILABLE?



environmental
defence

CONTRIBUTORS

This report was funded by The Charles Stewart Mott Foundation.



We acknowledge that since time immemorial, Indigenous nations and tribes have been the original inhabitants and stewards of the Great Lakes - St. Lawrence Seaway basin, living in balance with the lands, the waters, the plants, and the animals.

The Great Lakes - St. Lawrence Seaway basin encompasses the traditional territories of the Anishinaabeg, the Haudenosaunee, the Huron-Wendat, Mississaugas of the Credit, the Algonquin, the Maliseet, the Innus, and the Mi'kmaq peoples who have inhabited these lands and waters for over 10,000 years. All of these nations are sovereign nations and are rights holders in their respective territories.

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INTRODUCTION

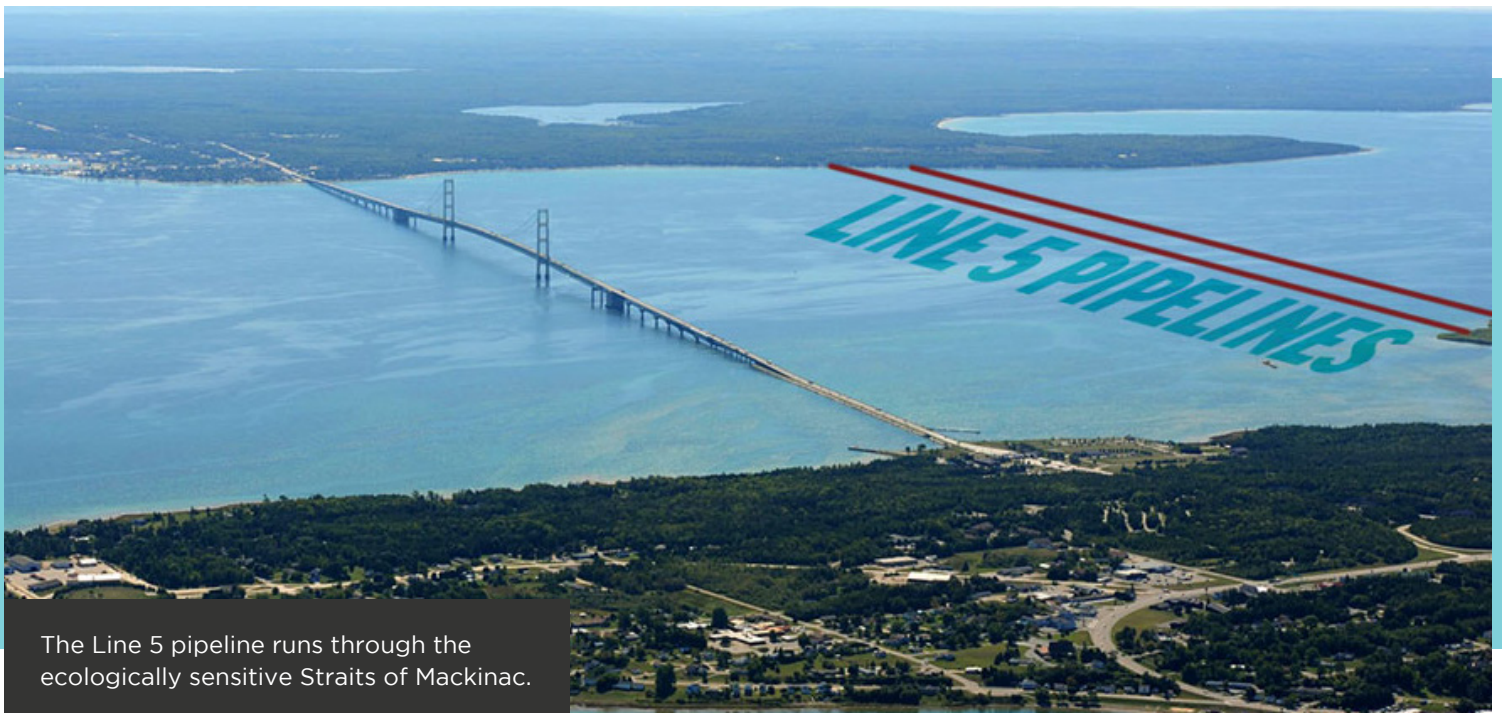
Enbridge's Line 5 pipeline has been the subject of considerable debate in recent months and years. On the one side, opponents, including Michigan Governor Whitmer, Indigenous Tribes in the U.S., First Nations in Canada, and environmental organizations on both sides of the border all want the pipeline shut down due to the risk it poses to the Great Lakes, the largest body of freshwater in the world. Michigan leadership and Indigenous tribes in Wisconsin and Michigan have all pursued legal action to have Line 5 shut down.

On the other side, the pipeline's supporters argue that it is a critical piece of infrastructure that provides Michigan, Ontario and Quebec refineries and petrochemical plants with crude oil and natural gas liquids that would be difficult to deliver to market without it. Proponents have gone as far as to claim that the closure of Line 5 would cause an energy crisis in Canada. This document is intended to test the veracity of those claims and provide an assessment of the impacts of closing Line 5.

Environmental Defence commissioned research and analysis by an energy industry expert with decades of experience in the oil and gas sector. This research will help the public and government understand the facts regarding Ontario and Quebec's dependence on Line 5, which is a part of the Lakehead System (see Figure 1).

The report argues that the closure of Line 5 would be manageable and that there are options available to meet demand for oil and refined products (e.g. gasoline) in Ontario and Quebec without Line 5.

The report also includes an assessment of the consumer impacts of one of the alternative scenarios to Line 5 and concludes that it would raise the price of gasoline by just 1.8 cents per litre.



The Line 5 pipeline runs through the ecologically sensitive Straits of Mackinac.

KEY POINTS

This document presents a summary of the key elements of the [analyst's work](#) and some of the implications from the perspective of Environmental Defence*. The key points are that:

1

In the event of a Line 5 closure, viable alternatives exist that would address the potential crude oil shortfall to Sarnia, Ontario. With an orderly shutdown of Line 5, the projected cost of alternatives essentially goes unfelt by consumers with a 1.8 cent increase in gasoline.

2

Line 78, another Enbridge pipeline that also goes to Sarnia, could reduce that shortfall. As it stands today, Line 78 is not being used to its full capacity and can reduce any shortfall to 255,000 bpd. Line 78 was also designed with more capacity than it currently has to move oil. It could further reduce the shortfall to 119,000 bpd by making upgrades to pumping facilities but without making changes to the pipeline itself.

3

Existing rail capacity and/or tankers could make up any remaining shortfall. Additional rail capacity could also be added relatively easily. 119,000 bpd would equate to 2-3 additional trains per day moving through existing routes that are currently transporting oil. For marine tankers, 119,000 bpd would equate to roughly one additional marine tanker or less on routes currently in use which serve the Valero refinery in Quebec.

4

The 80,000 bpd of Natural Gas Liquids (NGLs) currently moved by Line 5 would likely need to find another route, though there are alternative sources of NGLs that could be sourced from nearby regions in [PADDs 1 and 2](#).

Enbridge continues to insist that the safest way to move oil is through pipelines. But when it comes to Line 5, this could not be further from the truth. This 69-year-old, deteriorating pipeline is at an increased risk of rupture, and it runs right through the heart of the Great Lakes which hold 84 per cent of North America's freshwater. While there are no good options for transporting oil, in the case of this aged and dangerous pipeline, exploring other options is not only reasonable, but necessary.

Canada's federal government has tried to intervene in support of keeping Line 5 open by invoking a 1977 pipeline treaty. However, the government's position appears to be an uncritical acceptance of the arguments made by Enbridge regarding the options available. The report's findings and this document challenge those arguments and are intended to inform Canada's approach going forward.

*The data and facts presented in this document are taken directly from the research and analysis that was commissioned by Environmental Defence. [You can read the full report here](#). Any additional facts added for context have been linked to their external sources.

GOING FORWARD, WE BELIEVE THE CANADIAN GOVERNMENT HAS THE OBLIGATION TO:



Assess the alternatives to Line 5.



Work to ensure there is an adequate supply of gasoline and refined products in Ontario and Quebec in the near term.



Prioritize the protection of our greatest freshwater source.



Uphold Indigenous treaty rights within the Great Lakes basin, including treaty rights being exercised by Anishinaabeg peoples from across Wisconsin, Michigan, and Ontario to protect their territorial lands, waters, and ways of life.



Swiftly advance the just transition off of fossil fuels in response to the climate crisis and take meaningful action on meeting Canada's clean energy commitments.



Advocate in the best interests of Canadians.



Uncritically accepting Enbridge's arguments does not achieve these objectives. Spending political capital to lobby the U.S. in support of this pipeline is also highly questionable given the global climate emergency.

LINE 5: THE CASE FOR CLOSURE

An oil pipeline rupture into the Great Lakes would be devastating. It could engulf **over 1100 kms of shoreline** along Lake Michigan and Lake Huron and would have lasting impacts on the Great Lakes ecosystem.

A spill is a definite possibility. Line 5 is 69-years-old and is operating almost 19 years passed its designed lifespan. **It has leaked at least 29 times since 1953 spilling at least 4.5 millions litres of oil into surrounding lands and waters. Numerous safety violations have occurred and the pipeline has been in a state of ill repair** not only in the area that crosses above the lakebed through the Straits of Mackinac, but also **along other parts of its route** from Superior, Wisconsin to Sarnia, Ontario.

Studies estimate that a worst-case oil spill from Line 5 would cause **damages between \$1.8 to \$6.3 billion**, and **these numbers do not include impacts to Canadian shorelines**. A spill would impact drinking water supply, fisheries, tourism, shoreline ecosystems, shoreline recreation, businesses who depend on the Great Lakes, human health, and more.

Enbridge's also has a poor track record when it comes to spills and spill response. **In 2010, Line 6B ruptured into the Kalamazoo River resulting in over \$1 billion in clean up costs.** It took Enbridge 17 hours to shut down Line 6B. **It wasn't even Enbridge that detected the spill** — a local utility worker who smelled gas did. **Line 5 is even older than Line 6B was at the time of the rupture. Line 5 is 69-years-old and Line 6B was 41-years-old when it ruptured.** On top of this, between 2000-2014 alone, there have been over **1,276 spills across the entire Enbridge**



A diver documents Line 5 in a state of disrepair on the lakebed.

pipeline system that have dumped over 35 million litres of oil into the environment. That's an average of 91 spills and 2.5 million litres per year.

Strong opposition to Line 5's continued operation has surfaced from multiple voices concerned about the risks to the Great Lakes, a critical freshwater ecosystem for North America and the planet. Line 5 directly threatens the waters, lands, and way of life for Indigenous and non-Indigenous peoples living

in nearby shoreline communities. Anishinaabeg Indigenous nations on both sides of the border have called for it's closure, along with Michigan Governor Whitmer, Attorney General Nessel, and environmental organizations from both Canada and the US.

All Tribes in Michigan have passed resolutions calling on the shutdown of Line 5 and have been pursuing their treaty rights in the courts. The Bad River Band of the Lake Superior Tribe of Chippewa from Northern Wisconsin also voted in 2017 to not renew the easements for Line 5. This was due to multiple safety concerns about the aged pipeline's threat to the Bad River's watershed and Lake Superior, and they currently have a federal lawsuit against Enbridge. The Anishinabek Nation which represents 39 First Nations communities in Ontario has also come forward in support of seeking solutions for a Line 5 closure.

In addition to the imminent and significant threat the pipeline poses to the Great Lakes and the communities who depend on them, there is also the need to address greenhouse gas emissions.

We are now in what can be truly called a climate emergency. We have seen devastating natural disasters such as heat waves, forest fires, flooding, and intense storms occurring at a much greater frequency due to the impacts of human caused global warming. **The Great Lakes and their many ecosystems are also seeing unprecedented changes occurring due to climate change impacts** that will pose great challenges in the decades to come. The need to implement robust climate measures has never been more pressing.

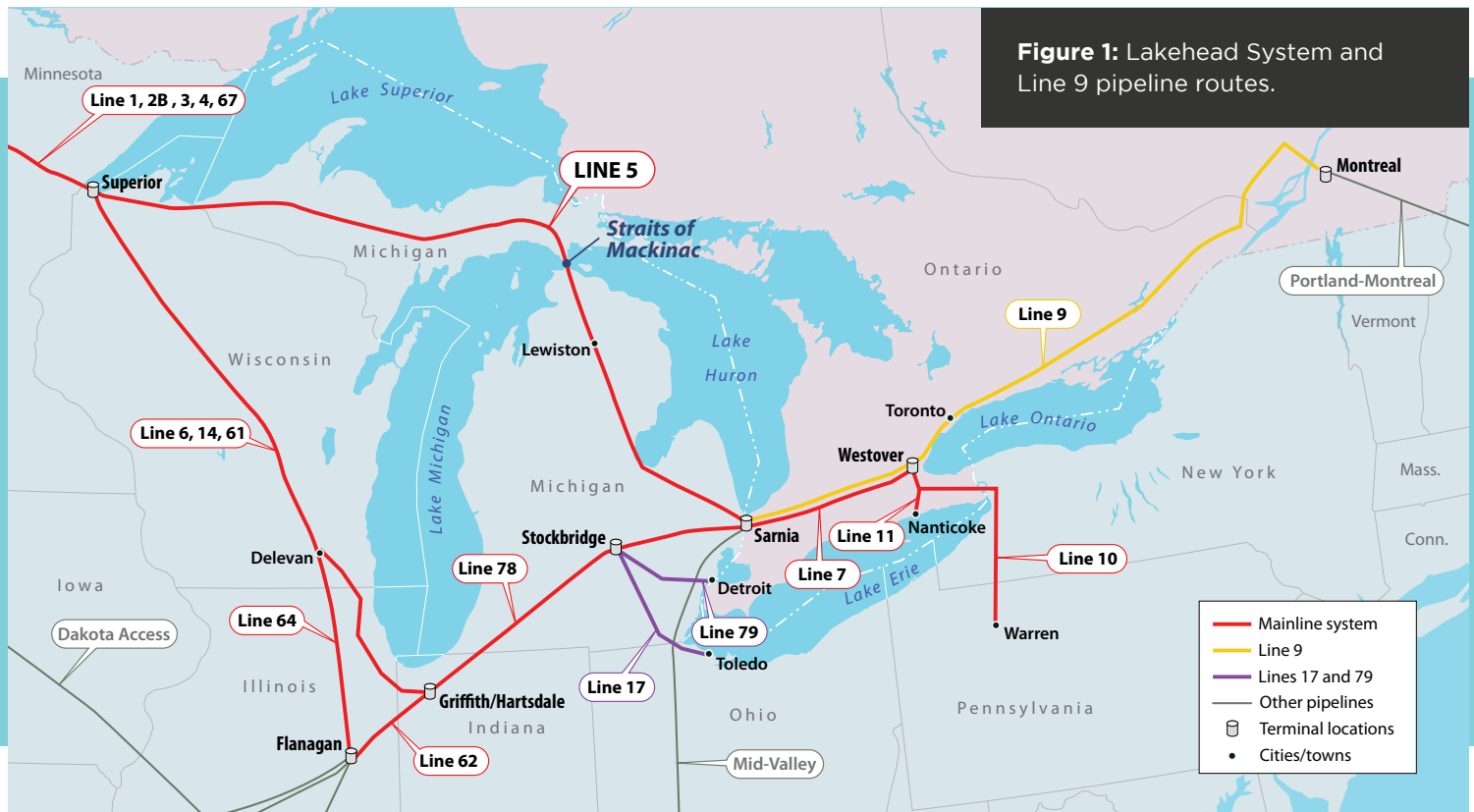


A flotilla of activists raise awareness about the dangers of Line 5.

LINE 5: IN CONTEXT

Line 5 is part of Enbridge's Mainline System. It carries oil from Superior, Wisconsin, crosses through the Straits of Mackinac above the lakebed, and then carries on to Sarnia, Ontario.

From there, some oil is offloaded to Sarnia refineries while some is shipped further East, predominantly via Line 9 to refineries in Quebec.



Line 78 is also part of Enbridge's Mainline system. It is broken into two parts. Line 78A goes from Flanagan, to Griffith/Hartsdale, and ends at Stockbridge, about 200 kms from Sarnia. And Line 78B goes from Stockbridge to Sarnia. Line 78A has more capacity than Line 78B because 78A feeds US refineries before carrying on to Sarnia. Line 78 was built between 2011-2015 to replace and expand Line 6B after that pipeline spilled over 3.12 million litres of oil into the Kalamazoo river in 2010. Line 78 was constructed with more than double the capacity of the original Line 6B. Permitting documents also state Line 78 was built to move more oil than it currently does. Upgrading Line 78 to its

ultimate capacity would not require any work on the pipeline itself. All that would be required are upgrades to, or perhaps the addition of, pumping stations. Table 1 shows what the current capacity in bpd is for Line 78, as well as what the ultimate design capacity is in bpd for Line 78.

For the purposes of this report, we have run the numbers to show what the shortfall would be in a scenario where Line 5 is closed and Line 78 is left at current capacity (570,000/500,000 bpd), referred to as the "Line 78 constrained" scenario. We have also examined the numbers if Line 78 were upgraded to its ultimate capacity

Table 1: Line 78 Capacity

	Line 78A (to Stockbridge)	Line 78B (to Sarnia)
Current Annual Capacity (bpd)	570,000	500,000
Ultimate Annual Capacity (bpd)	800,000	525,000

(800,000/525,000 bpd), referred to as the “Line 78 ultimate design” scenario. This is examined in Table 2.

It’s important to note that, **according to calculations by our expert analyst, the actual oil delivered to Sarnia is less than the current capacity of Lines 5 and 78**, meaning both pipelines are not currently running at full capacity — Line 5 does not carry 540,000 bpd from Superior to Sarnia, nor does Line 78 carry 570,000/500,000 bpd from Flanagan to Sarnia. This means **spare capacity already exists within Line 78 to largely make up for the closure of Line 5**. In 2018 (the last year that data is available) 644,000 bpd were delivered

to Sarnia (see Table 2). Not all of this oil is ultimately destined for Canada. About 60,000 bpd passes through Canada to feed the United Refinery in Warren, Pennsylvania.

Another important fact to note is that Line 9, which now feeds Quebec refineries, was reversed in 2015. Prior to 2015, Quebec refineries received their crude from other sources. This is important to take into account because it demonstrates that there have been, and continue to be, multiple options for sourcing crude to Quebec refineries besides Line 9 which runs west to east and receives its crude supply from Line 5.

Table 2: Mainline Capacity to Sarnia (bpd)

	Today	Line 78 Constrained	Line 78 Ultimate Design
Line 5	540,000	0	0
Line 78A/78B	570,000/500,000	389,000	800,000/525,000
Actual Deliveries to Sarnia	644,000		
Shortfall (Deliveries - Capacity)		255,000	119,000

Table 2 shows that if Line 78’s capacity is left unchanged, the shortfall into Sarnia compared to oil deliveries would be 255,000 bpd after accounting for 181,000 bpd which gets shipped on 78A and offloaded at Stockbridge to feed U.S. refineries. If 78’s capacity was increased to meet the ultimate design capacity, the shortfall would be 119,000 bpd.

REFINING CAPACITY & REFINING DEMAND

The refining capacity refers to how much crude oil can potentially be processed by refiners and the refining demand refers to how much crude oil is actually being delivered to refiners based on local demand for refined products. Crude oil shipped to Sarnia on Enbridge's Mainline feeds Ontario refineries in Sarnia and Nanticoke, and onwards east to Warren,, Pennsylvania, as well as Quebec refineries in Montreal and Lévis.

The refineries and their capacities are listed below (Table 3), with refining capacity for Ontario and Quebec refineries totaling at 765,000 bpd. The capacity for the United Refinery in Warren, PA is approximately 65,218 bpd.

The total deliveries on the Mainline system to Quebec and Ontario refineries is 684,000 bpd (Table 4). We estimate that the Mainline system delivers 60,000 bpd to the United Refinery in Warren, PA, (which is 92 per cent of its capacity). An additional 100,000 bpd of oil is currently shipped to Canada refineries by means other than Enbridge's Mainline system.



Table 3: Capacity of Refineries, ON & QC

Province	Owner	Location	Capacity (bpd)
Ontario	Imperial Oil	Sarnia	121,000
	Shell	Sarnia	75,000
	Suncor	Sarnia	85,000
	Imperial Oil	Nanticoke	112,000
Total			393,000
Quebec	Suncor	Montreal	137,000
	Valero	Lévis	235,000
Total			372,000

Table 4: Crude Oil Balance, ON & QC

	Thousand Barrels Per Day
Total volume delivered to Sarnia on Mainline NGL delivered to Sarnia (estimate)	724 80
Crude oil delivered to Sarnia on Mainline	644
United Refining crude oil runs (estimate)	60
Crude delivered to Sarnia on Mainline processed by Ontario and Quebec refineries	584
Ontario refinery crude oil runs Quebec refinery crude oil runs	357 327
Total Ontario and Quebec crude oil runs	684
Crude oil delivered to Ontario and Quebec refineries by rail or marine tanker	100

OPTIONS TO MAKE UP THE SHORTFALL ASIDE FROM INCREASING LINE 78'S CAPACITY

Rail: rail offloading facilities exist to take off 110,000 bpd currently. 100,000 bpd of this capacity is in use today, as shown in Table 4. Additional offloading capacity could be added with little difficulty. Rail cars and onloading facilities exist as evidenced by large volumes of oil by rail that have moved historically. This involved installing new railcar loading facilities to permit shipments of crude oil by rail, while refiners in Central and Eastern Canada and in the US East Coast, Gulf Coast and West Coast regions installed rail car unloading facilities. Railcars carry roughly 650 barrels of oil and trains have roughly 100 railcars per train. 119,000 bpd would equate to 2-3 additional trains per day moving through existing routes that are currently transporting oil.

Tankers: The Valero refinery in Lévis, Quebec receives all of its oil by tanker today. Tankers currently sail from Montreal at the terminus of Line 9. Prior to the reversal of Line 9 in 2015, tankers sailed from elsewhere. The Valero refinery has a capacity of 235,000 bpd all of which is serviced by tanker. Long Range (LR) marine tankers carry between 310,000 and 550,000 barrels and Very Large Crude Carriers (VLCC) can carry up to 1,000,000 barrels. 119,000 bpd would equate to roughly one marine tanker or less on routes currently in use that serve the Valero refinery.

Table 5: Rail Offloading Capacity of Ontario and Quebec Refineries

Province	Owner	Location	Capacity (bpd)
Ontario	Imperial Oil	Nanticoke	20,000
Quebec	Suncor	Montreal	30,000
Quebec	Valero	Lévis	60,000
Total			110,000

Pipeline: The Portland, Maine to Montreal pipeline can deliver 223,000 bpd to Montreal, however the Suncor refinery's capacity is 137,000 bpd. It is noteworthy that this pipeline was designed for a lifespan of 60 years and it is now **80-years-old**, meaning, this is another old, dangerous pipeline that is ready to be decommissioned. In 2020 flows dropped to under 5000 bpd according to Canadian Energy Regulator data.

Table 6: Summary of Options to Make Up Remaining Shortfall Aside from Line 78 Expansion

Options	Existing
Rail	110,000
Tanker	235,000
Pipeline	137,000
Total	482,000

In determining how to make up for the shortfall caused by the closure of Line 5, there are going to be tough choices to make as to what is best, but it is entirely possible to meet current demand without Line 5. The main takeaway is that there is ample capacity to make up any shortfall that would be caused by a Line 5 closure. The prioritization of protecting the Great Lakes and addressing climate change needs to be at the forefront. The stakes are too high to continue to put the Great Lakes and the over 400 water bodies that this pipeline crosses at risk from an old, deteriorating and leaking pipeline.

COSTS OF ALTERNATIVES

The price impacts of each of these various scenarios have not been fully examined, but the potential price impacts of one scenario has been calculated. In short, the calculations indicate that closing Line 5 would have minimal, if any, impact on consumer prices.

According to [the analysis](#) by Meyers Energy Consulting, LLC, upgrading Line 78A and Line 78B will allow the majority of the Line 5 shortfall to move through this pipeline. If the remaining balance is made up with an increase of oil by rail it would result in a price increase for consumers of just 1.8 cents per litre. This estimate is based on the assumption that refiners in Ontario and Quebec continue to source crude oil from Western Canada and the US Upper Midwest and ship the crude via the Mainline System and by rail car.

Table 7: Transport Cost Increase for ON and QC Refineries from Potential Line 5 Shutdown

	Crude Volume (thousand bd)	Transportation Cost Increase (US\$/bbl)
Crude to ON and QC refineries on Mainline system	465	\$0.40
Incremental crude to ON and QC refineries by rail	119	\$10.00
Crude currently delivered to ON and QC refineries by rail/marine	100	\$0.00
Total ON and QC crude runs	684	\$2.01

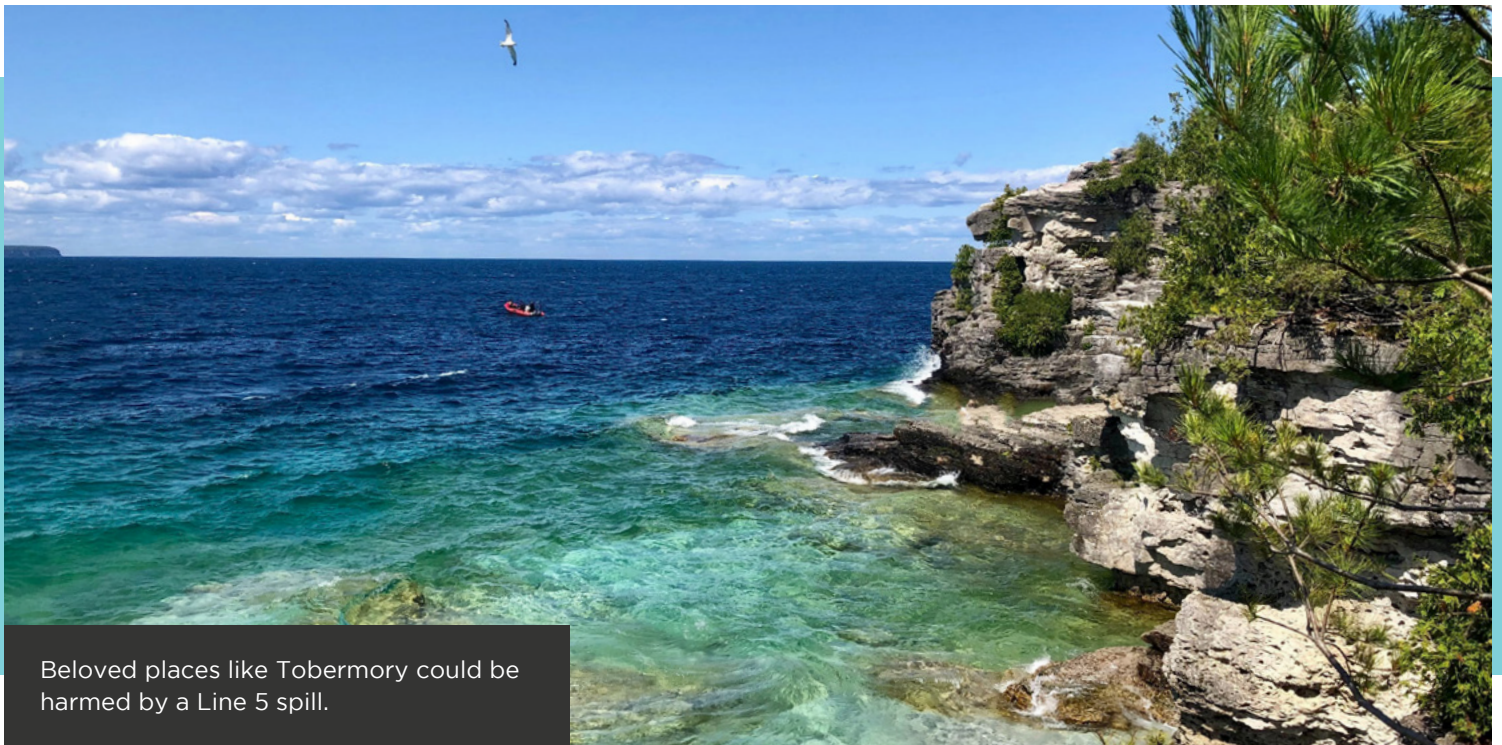
The weighted average cost increase for the total volume of crude delivered to and processed by the refineries in Ontario and Quebec would be \$2.01 US per barrel. If we assume an average liquid product yield of 90% for these refineries, this would translate into a refined product cost increase of \$2.24 US per barrel. At an assumed exchange rate of \$1.00 US to \$1.25 CDN, this would be equivalent to a refined product cost increase of \$2.79 CDN per barrel, or \$0.018 CDN per litre.



In other words, under this scenario the assumed increase in refined product cost for gasoline would be very modest. Gasoline prices are in a constant state of market fluctuation so a 1.8 cent increase would essentially go unfelt by consumers.

CHALLENGES & CONSIDERATIONS

The closure of Line 5 is inevitable - either through court order or due to a rupture. If alternatives are not explored, the pipeline's closure will cause a shortfall in Enbridge's Mainline System. Enbridge also has contracts with refineries to provide product, so there may need to be rationing - what is called "apportionment" in the industry. This would cause everyone to be equally short of oil, which is obviously sub-optimal. A better solution is a planned shutdown where Enbridge, the refineries and governments sort out how best to meet demand without Line 5. What this report clearly demonstrates is that options exist. Each option comes with its own factors to carefully consider and these factors need to be weighed against the major threat posed to the Great Lakes and the over 400 water bodies that Line 5 crosses.



Beloved places like Tobermory could be harmed by a Line 5 spill.

It is widely acknowledged that Enbridge's system is adaptable, and that the oil infrastructure in Canada is part of a global network. Canada ships oil to the U.S. and to other countries. Canada imports oil from the U.S. and other countries. Overall, Canada is a net exporter of oil by a wide margin.

There is a tone of energy nationalism often invoked by energy industry proponents. But most industry insiders seem to prefer leveraging the flexibility of oil markets, the ability for producers to ship to global markets, and the ability of refiners to import from global markets over an energy nationalism model where Canada meets domestic demand first, and only exports excess. It is also worth noting that 100,000-200,000 bpd on Enbridge's Mainline system is imported from the U.S. and is not Canadian in origin today.

CONCLUSION

Governments have a responsibility to protect the best interests of the people and the environment. The reasons for shutting down Line 5 are significant and strong. Canada must weigh the risks posed by the pipeline against whether or not the pipeline is actually needed to meet our energy needs. What this report shows is that shutting down Line 5 is possible and so is prioritizing the protection of the Great Lakes and the planet. In the years to come, it will be necessary to end our energy dependence on oil once and for all. The threat that moving oil poses to the lands and waters through which it passes and the existential crisis that the climate emergency poses to humanity are immense.



Currently, the immediate threat that the 69-year-old deteriorating Line 5 pipeline poses to the Great Lakes basin—our most valuable and important freshwater body resource in North America—is too great to continue to ignore.

To summarize, the following options exist:

- In the event of a Line 5 closure, viable alternatives exist that would address the potential crude oil shortfall to Sarnia, Ontario. With an orderly shutdown of Line 5, the projected cost of alternatives essentially goes unfelt by consumers with a 1.8 cent increase in gasoline.
- Line 78, another Enbridge pipeline that also goes to Sarnia, could reduce that shortfall. As it stands today, Line 78 is not being used to its full capacity and can reduce any shortfall to 255,000 bpd. Line 78 was also designed with more capacity than it currently has to move oil. It could further reduce the shortfall to 119,000 bpd by increasing its capacity to the volume it was designed for by making upgrades to pumping facilities but without making changes to the pipeline itself.
- Existing rail capacity and tankers could make up any remaining shortfall. Additional rail capacity could also be added relatively easily. 119,000 bpd would equate to 2-3 additional trains per day moving through existing routes that are currently transporting oil. For marine tankers, 119,000 bpd would equate to roughly one additional marine tanker or less on routes currently in use which serve the Valero refinery in Quebec.
- The 80,000 bpd of NGLs currently moved by Line 5 would likely need to find another route, though there are alternative sources of NGLs that could be sourced from nearby regions in [PADDs 1 and 2](#).

Closing Line 5 should also be accompanied by the development of a real and just plan for industry, workers, and society to get off fossil fuels. In the meantime, Canada can continue to meet our current crude oil and NGL demand for the region that is served by the Mainline system, without Line 5.