Energy East:

A Risk to Our Drinking Water

APRIL 2016

AUTHORS

environmental defence

TRANSITION INITIATIVE KENORA
Moving Beyond Fossil Fuels

THE COUNCIL OF CANADIANS / LE CONSEIL DES CANADIENS

REPORT PARTNERS

Conservation Council of New Brunswick
Équiterre
Greenpeace Canada
Northwatch
Manitoba Energy Justice Coalition

ACKNOWLEDGEMENTS

Energy East: A Risk to Our Drinking Water

A REPORT BY:

environmental defence

TRANSITION INITIATIVE KENORA
Moving Beyond Fossil Fuels

THE COUNCIL OF CANADIANS / LE CONSEIL DES CANADIENS

REPORT PARTNERS:

Conservation Council of New Brunswick
Conseil de conservation du Nouveau-Brunswick

équiterre

GREENPEACE

NORTHWATCH

MANITOBA ENERGY JUSTICE COALITION

ABOUT ENVIRONMENTAL DEFENCE

ENVIRONMENTAL DEFENCE is Canada's most effective environmental action organization. We challenge, and inspire change in government, business and people to ensure a greener, healthier and prosperous life for all.

environmental defence
INSPIRING CHANGE

ENVIRONMENTAL DEFENCE
116 Spadina Avenue, Suite 300
Toronto, Ontario M5V 2K6

Visit **environmentaldefence.ca** for more information

TABLE OF CONTENTS

EXECUTIVE SUMMARY

TransCanada's proposed Energy East pipeline project threatens the drinking water of more than **five million Canadians.** This alarming finding is the result of a detailed examination of Energy East's proposed route across Canada.

From Manitoba to New Brunswick, nearly 3,000 lakes, rivers, streams and aquifers, which are relied upon by millions of Canadians as sources of clean drinking water, would be at risk of oil spills. Just one pipeline rupture in any one of these vulnerable locations could contaminate drinking water sources for years to come.

Energy East threatens the drinking water of more than five million Canadians.

This report documents the nature and proximity of TransCanada's Energy East proposal to major municipal and community drinking water supplies across Canada. As proposed, the pipeline would threaten the drinking water of a significant portion of Canada's population:

Province	Canadians Whose Drinking Water is at Risk from Energy East
Manitoba	676,613
Ontario	1,040,788
Quebec	3,213,353
New Brunswick	130,679
Total Canadians impacted in four provinces by Energy East water risks	**5,061,433**

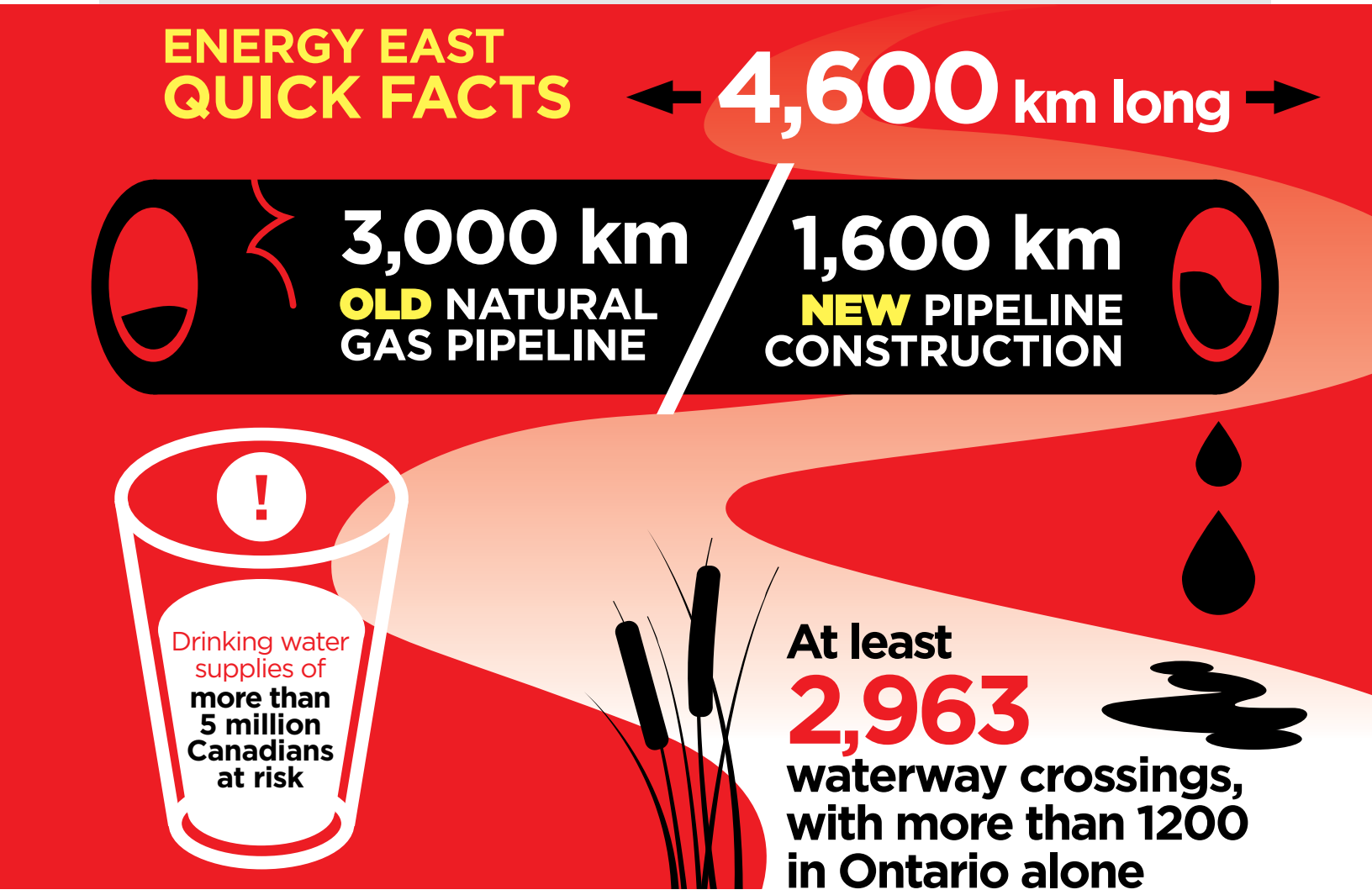
Energy East would be the largest tar sands pipeline in North America ever built. The pipeline would ship crude oil at high pressure 4,600 km across most of Canada, from Alberta to New Brunswick, crossing 2,963 identified waterways and countless smaller streams and wetlands along the way. Energy East could carry up to 1.1 million barrels (175 million litres) of oil every day, eclipsing the scale of other recent tar sands pipeline proposals, such as Northern Gateway or Keystone XL.

Given the amount of oil flowing through such a massive pipe, even a short duration spill has the potential to release large quantities of crude oil into the environment and cause substantial harm.

Crude oil spilled into the environment is rarely fully recovered. In most large pipeline ruptures into water, only a percentage of the released oil can be cleaned up.[1,2,3,4] This leaves a lasting legacy of water, soil and sediment pollution that means people and ecosystems are dangerously exposed to toxic hydrocarbon chemicals for decades. Acute or chronic exposure to hydrocarbon pollution can significantly impact ecosystems and human health.[5,6,7,8]

Energy East would not just carry conventional crude oil. The pipeline would also transport significant quantities of diluted tar sands bitumen (or dilbit for short). Laboratory tests and real-world pipeline spills have shown that this ultra-heavy bitumen separates from its diluents and sinks to the bottom of waterways.[9,10,11]

One example of the difficulty of cleaning up a dilbit spill is Enbridge's Line 6b pipeline rupture in 2010, which spilled more than 3 million litres of tar sands diluted bitumen into a small creek and subsequently, the Kalamazoo River near Marshall, Michigan. First responders were ill-prepared to clean up the bitumen, which sank to the bottom of the creek and the river. The spill spread



nearly 60 km downstream before reaching a dam, which narrowly prevented dilbit from reaching Lake Michigan. Cleanup efforts were complicated by submerged bitumen, necessitating extensive dredging of the river, a process which took years and cost more than $1billion.[12] The river is still degraded as some submerged oil contamination remains.

In December 2015, the U.S. National Academy of Sciences (NAS) released a comprehensive study that shows how diluted bitumen substantially differs from other types of oil commonly moved by pipeline, confirming the Kalamazoo experience. The properties of dilbit create unique and complex spill scenarios as bitumen sinks in water after a short period of weathering. The study concluded that special response strategies and tactics are needed to respond and clean up diluted bitumen spills; however, these have not yet been developed in Canada or the U.S. The pipeline industry, government agencies and first responders are simply not prepared to deal with these additional risks.

Canadian regulators, oil companies and pipeline companies, including TransCanada, have repeatedly refused in public hearings and communications materials to acknowledge the added hazards caused by shipping dilbit.[13,14] But their refusal to acknowledge the added risks does not erase the actual risks.

These safety concerns are compounded by TransCanada's poor record on pipeline ruptures and spills. The natural gas pipeline proposed for conversion as part of the Energy East project suffered from 10 ruptures over the past 25 years.[15] TransCanada's Keystone pipeline, which also consists of a converted natural gas pipeline and newly constructed segments, leaked 71 times in its Canadian section in the first two years of operation." Add this as a footnote: Transportation Safety Board. (2016). Pipeline occurrence data from January 2004. Government of Canada.[16]

TransCanada's Keystone 1 system leaked 71 times in its Canadian section in the first two years of operation.

Given the particular risks of diluted bitumen spills and TransCanada's appalling safety record, it is only prudent to take a closer look at the threat Energy East poses to Canadians' drinking water supplies. However, the risk assessments contained in this report are conservative in nature. The potential exists for larger spill profiles than those captured in the methodology used. In most areas, only municipal-scale drinking water systems were evaluated for direct spill risks. Remote and small communities as well as First Nations communities along the pipeline route not included in the estimated total would also face direct risks to their drinking water from Energy East.

It's worth emphasizing that Energy East would be an export pipeline, with up to 90 per cent of its oil expected to be shipped overseas unrefined. It would add little to Canada's economy and very few permanent jobs. Yet more than five million Canadians are being asked to accept the risks Energy East poses to their drinking water.

Safe, clean drinking water is fundamental to public health. Water is a building block of life. Its protection is not an aspirational policy goal but our collective duty.

It must be clear to all levels of government that safeguarding our nation's drinking water supplies should come before the interests of a few oil and pipeline companies. It's time for Canadians to reject Energy East.

METHODOLOGY

This report shows that TransCanada's proposed Energy East oil pipeline project threatens the drinking water of more than five million Canadians. As mentioned above, this is a conservative estimate.

For this study, we assessed the safety of drinking water supplies for over two dozen Canadian municipal regions that would be directly threatened by an Energy East oil spill (for details see tables below). However, the list is not exhaustive as many more rural residents, small towns, villages, and First Nations communities would also see their drinking water jeopardized by Energy East.

In evaluating risk to municipal drinking water, we assessed risk as a function of distance from a pipeline crossing or corridor, with any waterway within 60 km downstream from the pipeline labeled as "at risk." In many cases, the waterways listed in the tables below are less than 10-20 km from the pipeline. Our 60 km threshold is based on the real world example of the July 2010 rupture of Enbridge's Line 6b in Michigan, which saw diluted bitumen spill into Talmadge Creek and subsequently into the Kalamazoo River, contaminating at least 60 km of the latter.[17]

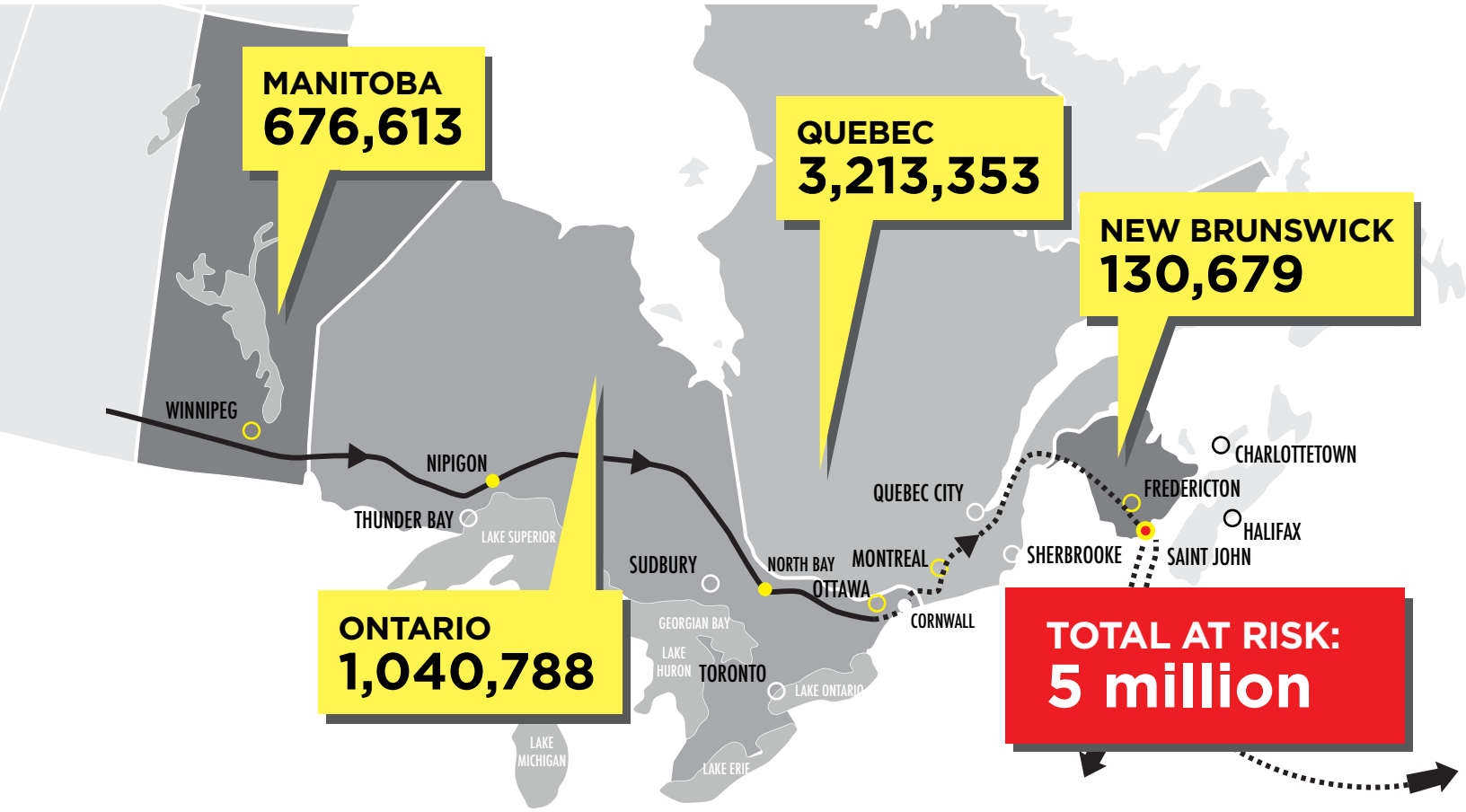
Our analysis is based on a 60 km downstream spill radius – that's how far diluted bitumen spread during the 2010 Kalamazoo River pipeline spill.

When considering risks to source waters from overland spills, it is not possible to describe a one-size-fits-all "at risk" zone because geography and hydrology – how water flows over land and through soil – differs among sites. For source waters that we have identified as being at risk from overland spills, we have assessed that risk on a case-by-case basis, taking into consideration local topography and other physical site characteristics. We have also factored in regional policies, such as source water protection plans and municipal water safety by-laws, to guide our assessments.

For a question of consistency, we used population data from the most recent federal census (2011), except for the City of Saint John, NB (2011 census population 70,063) for which the City Council has described a population of 45,450 whose drinking water is at risk. This is a conservative estimate, as the 2015 combined population for Montreal and Laval increased by 373 948. For the province of Quebec, we used the Ministère du Développement durable, Environnement et Lutte contre les changements climatiques' water distribution directory[18] and identified municipalities whose drinking water is sourced up to 60 km downstream from the pipeline. We deducted the number of people whose muncipal water is taken from an underground water source.

For our Montreal area population estimate, we looked at the 91 municipalities and communities comprised in the Montreal Census Metropolitan Area and used the same criterias to deduct municipalities that were less likely to be affected by a spill. We completed our analysis using data from a study commissionned by the Communauté métropolitaine de Montréal (CMM)[19]. From Statistics Canada's 2011 population figure of 3,824,221, we identified a total of 2,888,416 people whose drinking water would be at risk in the greater Montreal region.

RESULTS:
NUMBER OF CANADIANS WHOSE DRINKING WATER IS AT RISK



Based on the methodology described above, our research shows that millions of Canadians' drinking water sources would be at risk from Energy East. In the tables below, we highlight the specific water sources and number of Canadians at risk by province.

WATER SOURCES

Aquifers: porous layers of rock or soil that are saturated with groundwater are called aquifers. Water can be extracted from aquifers through the drilling of wells.

Wellfield: a group of wells that together draw water from the aquifer to supply a public water system.

Wellfield Protected Area: the designated area associated with and surrounding a wellfield that replenishes or recharges the wells and that has development restrictions to prevent impacts to drinking water.

Watershed Protected Area: the designated watershed that supplies surfaces waters used for municipal drinking water sources and that has development restrictions to prevent impacts to drinking water.

Source Protection Area: in Ontario, the drinking water source protection area is under the protection of a conservation authority whose authority is mandated through the Ontario Conservation Authorities Act.

Manitoba

Municipality at Risk	Population	Source Water At Risk from Energy East
Portage La Prairie[20]	12,996	Assiniboine River: Energy East would cross the river just upstream of the Portage Diversion, a 29 km water canal that diverts the Assiniboine River, the source of the city's drinking water, to Lake Manitoba.
Winnipeg[21,22,223]	663,617	Shoal Lake: Energy East would run across the north end of the Shoal Lake basin, upstream of the City of Winnipeg's drinking water intake on Indian Bay in Shoal Lake (on the western edge of the Lake of the Woods). It would also threaten the entire length of the Winnipeg drinking water aqueduct from Shoal Lake to the Deacon Reservoir in Winnipeg.
Total Manitoba Population at Risk	**676,613**	

Ontario

Municipality at Risk	Population	Source Water At Risk from Energy East
Kenora[24,25,26]	15,348	Lake of the Woods: Energy East would traverse the Upper Winnipeg River watershed at the foot of Lake of the Woods, jeopardizing several thousand rural wells and private lake-sourced water intakes. The City of Kenora's municipal water would be at risk from surface and groundwater seepage reaching its intake pipe at the north end of Lake of the Woods.
Nipigon[27,28]	1,631	Nipigon River (flows into Nipigon Bay, on Lake Superior, near Thunder Bay): Energy East would cross the Nipigon River above the town's source water intake on Nipigon Bay, a federally listed Area of Concern that has undergone significant rehabilitation supported by the Ontario and the federal governments to reduce legacy impacts from decades of industrial pollution.
North Bay[29,30]	53,651	Trout Lake: Energy East would cross the source water protection area for North Bay that extends east to the Mattawa river, crossing the escarpment on the northern shore of Trout Lake less than 6 km from the city's main intake pipe in Delaney Bay. The line threatens both surface and groundwater recharge areas in the Trout Lake basin. In the Western and central part of the basin, where thick deposits of sand and gravel are bisected by the pipeline, a rupture would contaminate the groundwater. In the eastern section of the basin, the line rests on exposed bedrock in an area of steep slopes. Any spill in this area would rapidly flow downslope to Four Mile Bay a distance ranging from 2 km to 500 m.
Arnprior[31,32]	8,114	Madawaska River: Energy East would cross the river a little over 10 km upstream of the community's drinking water intake, just above the confluence of the Madawaska and Ottawa Rivers.
Ottawa and surrounding area[33]	962,044	Ottawa and Mississippi Rivers: the City of Ottawa has two source water intakes, both on the Ottawa River within the Mississippi-Rideau Source Protection Area. Also covered within the Mississippi-Rideau Source Protection Area are more than a dozen other municipal wellheads, highly vulnerable aquifers, and significant groundwater recharge areas servicing the entire region, including the Oxford Aquifer near North Grenville that services 10,000 private wells.
Total Ontario Population at Risk	**1,040,788**	

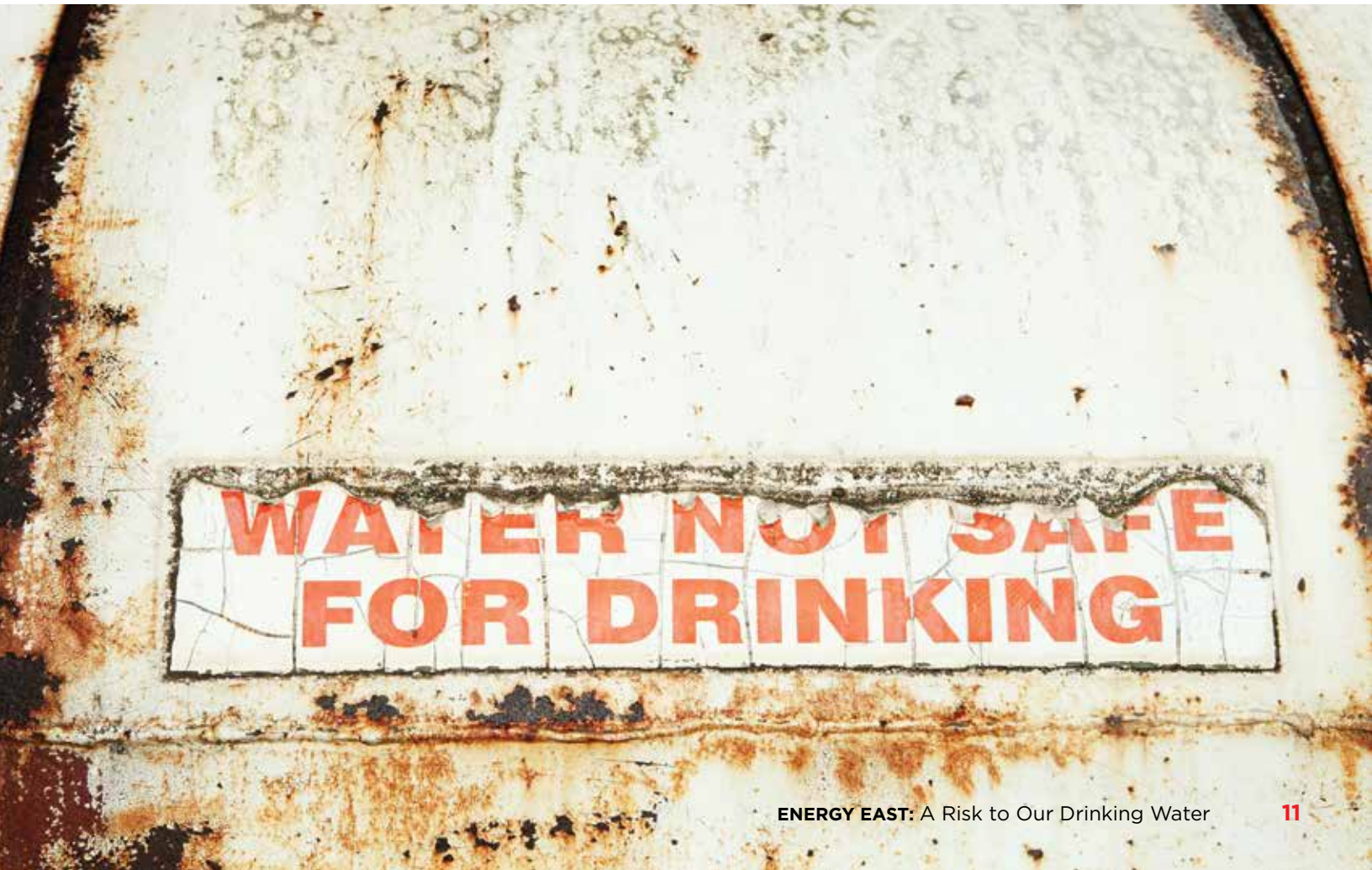
Quebec

Municipality at Risk	Population	Source Water At Risk from Energy East
Montreal Region[34]	2,888,416	Rivers downstream of the Ottawa River, including the Saint Lawrence River, Rivière des Mille-Îles and Rivière des Prairies (both part of the Ottawa River system) which serve Laval and other North Shore communities in the Montreal CMA; Also, Energy East would cross Rivière L'Assomption upstream of the water intake for Repentigny and L'Assomption.
Contrecoeur[35]	6,252	Rivière des Mille-Îles, Rivière des Prairies, Saint Lawrence River: Contrecoeur's intake is 25 km downstream from the proposed pipeline crossing on the two rivers that are tributaries to the Saint Lawrence.
Berthierville water intake[36]	8,000	Rivière des Mille-Îles, Rivière des Prairies, potentially Rivière Bayonne, and Saint Lawrence River: Berthierville and Saint-Geneviève de Berthier water intake are 50 km downstream from the pipeline crossing on Rivière des Mille-Îles and the Rivière des Prairies, tributaries to the Saint Lawrence.
Saint-Ignace-de-Loyola[37]	1,986	Rivière des Mille-Îles, Rivière des Prairies, Saint Lawrence River: Saint-Ignace-de-Loyola's intake is 50 km downstream from the proposed pipeline crossing on the two rivers that are tributaries to the Saint Lawrence.
Trois-Rivières[38]	48,285	Rivière Saint-Maurice: Energy East would cross the Saint-Maurice River 10 km upstream from the confluence of the Saint-Maurice and Saint Lawrence Rivers.
Bécancour[39]	12,438	Saint Lawrence River, Rivière Saint-Maurice: Energy East crosses the Saint-Maurice 10 km upstream from the confluence of the Saint-Maurice and Saint Lawrence Rivers, the source water for Bécancour.
Donnacona[40]	6,283	Rivière Jacques-Cartier: Donnacona's source water intake on Rivière Jacques-Cartier is less than 10 km downstream of the planned pipeline crossing over the river.
Saint-Augustin-de-Desmaures[41]	16,900	Saint Lawrence River: Saint-Augustin-de-Desmaures's intake is 25 km downstream from the location currently planned for the major pipeline crossing of the Saint Lawrence River.
Sainte-Foy (a borough of Québec City)[42]	98,868	Saint Lawrence River: The intake for Sainte-Foy is about 25 km downstream from the location currently planned for the major pipeline crossing of the Saint Lawrence River.

continued on page 11...

Quebec Cont'd

Municipality at Risk	Population	Source Water At Risk from Energy East
Lévis[43]	110,123	Rivière Chaudière, Saint Lawrence River: Energy East would cross the Rivière Chaudière about 10-12 km upstream of the City of Lévis' drinking water intake on the Rivière Chaudière at Charny, less than 5 km above its confluence with the Saint Lawrence.
Montmagny[44]	11,491	Rivière du Sud: Energy East would run 1 km south of, and in parallel to, the river that provides the municipal drinking water to Montmagny.
Témiscouata-sur-le-Lac[45,46,47]	5,096	Lac Témiscouata: Energy East runs parallel to Lac Témiscouata, within about 15 km of the lake.
Dégelis[48,49]	3,051	Lac Témiscouata: Dégelis received government funding to build a new water intake and treatment facility on Lac Témiscouata in late 2013. Lac Témiscouata is at risk as noted above.
Total Quebec Population at Risk	**3,213,353**	



New Brunswick

Municipality at Risk	Population	Source Water At Risk from Energy East
Edmundston[50,51,52,53]	16,032	Madawaska River and adjacent Wellfield Protected Areas: Wellfield Protected Areas in Edmundston are adjacent to the Madawaska, and the pipeline would cross this river less than 30 km upstream in neighbouring Québec.
Saint Leonard[54]	1,353	Saint John River and adjacent Wellfield Protected Areas: Energy East would cross Grande Rivière, a tributary of the Saint John River, about 25 km upstream of Saint Leonard. The community's source water is in a Wellfield Protected Area beside the Saint John River.
Saint Anne de Madawaska[55]	1,002	Rivière Verte and adjacent Wellfield Protected Areas: Energy East would cross Rivière Verte, a tributary of the Saint John River, about 30 km upstream of Saint Anne de Madawaska. The community's source water is in a Wellfield Protected Area beside the Saint John River.
Grand Falls[56]	5,706	Saint John River and adjacent Wellfield Protected Areas: at Grand Falls, the Wellfield Protected Area is right beside the Saint John River. The pipeline would cross Grande Rivière which flows into the Saint John River about 30 km upstream of Grand Falls.
Cambridge Narrows[57]	620	Salmon River: About 30 km upstream of the village of Cambridge Narrows, Energy East would cross the Salmon River, the municipal drinking water source for the community.
Hampton[58]	4,292	Kennebecasis River and Hampton Marsh: Energy East would cross the Kennebecasis River about 12 km upstream of Hampton and its ecologically distinct marsh area. Municipal source water comes from private wells within the basin.
Fredericton[59]	56,224	Cross Creek and other Nashwaak River tributaries: About 50 km upstream of Fredericton, Energy East would traverse Cross Creek and other tributaries of the Nashwaak River. The Nashwaak River converges with the north shore of the Saint John River at Fredericton. The City of Fredericton source water protection area is on the south shore of the Saint John River, suggesting that further modelling should be undertaken to measure risk to the city's drinking water supply.
Saint John[60,61]	45,450	Loch Lomond watershed, Latimore Lake, Mispec River: Energy East would run around the outer edge of the protected Loch Lomond watershed, at a distance of only 3 km. The pipeline would also run less than 3 km distant from the municipal drinking water intake at Latimore Lake where it crosses the Mispec River.
Total New Brunswick Population at Risk	**130,679**	

CASE STUDIES
COMMUNITIES AT RISK

WINNIPEG AND SOUTHERN MANITOBA

WINNIPEG, MANITOBA

PHOTO: AJ BATAC

Energy East would put the drinking water supplies in southern Manitoba, including Winnipeg, at risk.

The pipeline would directly cross many minor waterways, ditches and drains around Winnipeg, as well as the major rivers into which these tributaries feed. These include the Red, La Salle, Seine, and Assiniboine Rivers that provide drinking water to the communities of Portage La Prairie, Starbuck, Sanford, Kenton, Rivers, La Salle, Brandon, Selkirk and Sioux Valley.

The City of Winnipeg draws its drinking water through a 100 km aqueduct from Shoal Lake on the western edge of the Lake of the Woods basin in northwestern Ontario.[62]

In several places between Shoal Lake and Winnipeg, Energy East and two other existing natural gas pipelines would be located within just two metres of Winnipeg's drinking water aqueduct. The aqueduct is not only at risk of contamination in the event of a natural gas line explosion from one of the existing pipelines that could rupture the nearby oil pipeline, but also from small, more frequent, undetected pipeline spills between Falcon Lake and Hadashville where the aqueduct and pipeline are very close. A slow, pinhole leak in Energy East, which could go undetected for a long time, may permit oil to leak into the aqueduct through its pores and cracks.

The City of Winnipeg's public works committee is taking this threat seriously and has set aside one million dollars to study the problem.[63]

NIPIGON AND LAKE SUPERIOR

NIPIGON, ONTARIO

In 1990, a landslide on the Nipigon River left 75 metres of one of TransCanada's gas pipelines exposed in midair with no support.

Just north (upstream) of the town of Nipigon, the Energy East pipeline would cross the Nipigon River, from which the municipality of 1,600 draws its drinking water. Only 10 km to the south, the river merges into Lake Superior, the third-largest freshwater lake on Earth.

Nipigon is in a very dynamic geological zone where small earthquakes are not uncommon,[64] and the banks of the Nipigon River can destabilize during spring thaws and high groundwater conditions.[65] In 1990, a landslide on the Nipigon River left 75 metres of one of TransCanada's gas pipelines exposed in midair with no support. Had this been an oil pipeline, it would have likely collapsed under the weight of the oil inside, contaminating the river.

Even if detected quickly, due to its dramatic topography, and remote and hard to access location, a spill in this area could potentially result in millions of litres of diluted bitumen flowing down the Nipigon River into Lake Superior, contaminating the largest of North America's Great Lakes by volume.

Nipigon Mayor Harvey Richard has pointed out that unlike a natural gas leak, any spill from the Energy East pipeline would be "very difficult to clean up, especially in a waterway."[66]

NORTH BAY

TROUT LAKE, NORTH BAY, ONTARIO

PHOTO: JEFF BORDEN

Contamination of Trout Lake from a spill could impact North Bay's drinking water supply for years to come.

The municipality of North Bay in northeastern Ontario faces direct risks to its municipal drinking water supplies from the Energy East proposal. The natural gas pipeline that would be converted to oil for Energy East, traverses the north shore of the lake. Such a pipeline path is unlikely to have been permitted for crude oil.

Over 50,000 residents draw their drinking water from submerged municipal water intakes in Trout Lake, just east of the city. On the escarpment on the north shore of Trout Lake, many residents in Widdifield township obtain their drinking water supply from wells located in the sand and gravel deposits in the most important recharge area for Trout Lake. Contamination of these deposits would jeopardize this drinking water source, and would be extremely difficult to remediate.

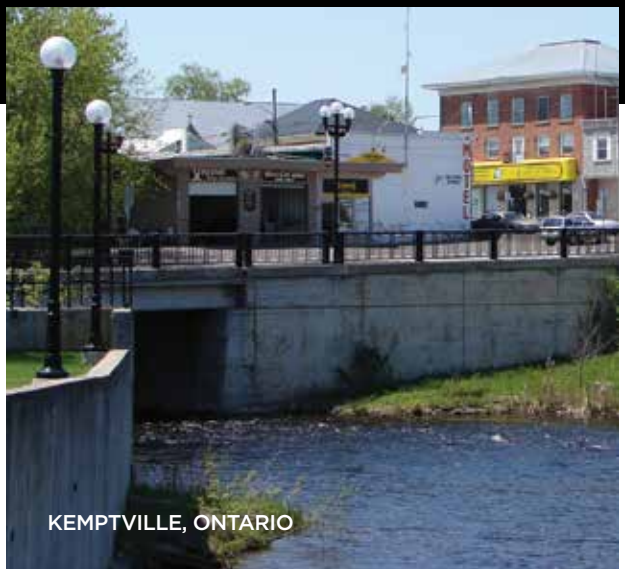
Any pipeline rupture along this section would see oil leak into the North Bay-Mattawa Conservation Authority-designated Source Water Protection Area, and could reach the drinking water intake in Delaney Bay in a matter of hours. Any residual chemical contamination of Trout Lake from a spill could impact North Bay's drinking water quality and safety for years to come.

North Bay, like many northern Canadian communities along the Energy East route, faces additional threats from a winter spill. While several feet of ice may cap a water body like Trout Lake or the Mattawa River, liquid water continues to flow underneath the ice. A dilbit spill in a frozen lake or river is more likely to go undetected by surface and aerial surveys for months, while contaminants continue to migrate with underwater currents.

"If something happens to Energy East here, if there is a spill, we'll be ruined," says North Bay Mayor Al McDonald. "Who would want to come here then?"[67]

The Ontario Ministry of Environment and Climate Change is currently completing a special study under the provincial *Clean Water Act* to assess the risks Energy East poses to this protected source of high-quality drinking water.

OXFORD AQUIFER, EASTERN ONTARIO



KEMPTVILLE, ONTARIO

In the municipality of North Grenville in eastern Ontario, 70 per cent of the 15,000 residents have private wells that draw their drinking water from the Oxford Aquifer.[68] These private wells are located within 1.6 km of the proposed pipeline for 55.6 km of Energy East's path.[69]

In its application, TransCanada claims that there is a low risk of well water contamination, assuming that any spilled oil plume wouldn't travel further than 100 metres in ground water. However, there are strong reasons to question this conclusion. The Oxford Aquifer was classified as "highly vulnerable to pollution" (the worst rating) by the Ontario government in the wake of the Walkerton water crisis. This is because the soil is very thin and cannot absorb much liquid in the event of a spill. The rock underneath the soil is also riddled with holes and fractures, meaning liquids on the surface – such as spilled crude oil or dilbit – can leach into this important drinking water source. The phenomenon of dilbit seepage through porous rock has been well documented in Alberta *in situ* mining operations, where high temperature steam is injected underground to release bitumen from tar sands.[70] Furthermore, a very small leak could go undetected for a long time, resulting in seepage into the aquifer.

A dry cleaning chemical spill in 1991 permanently poisoned 74 local wells in Manotick in eastern Ontario.

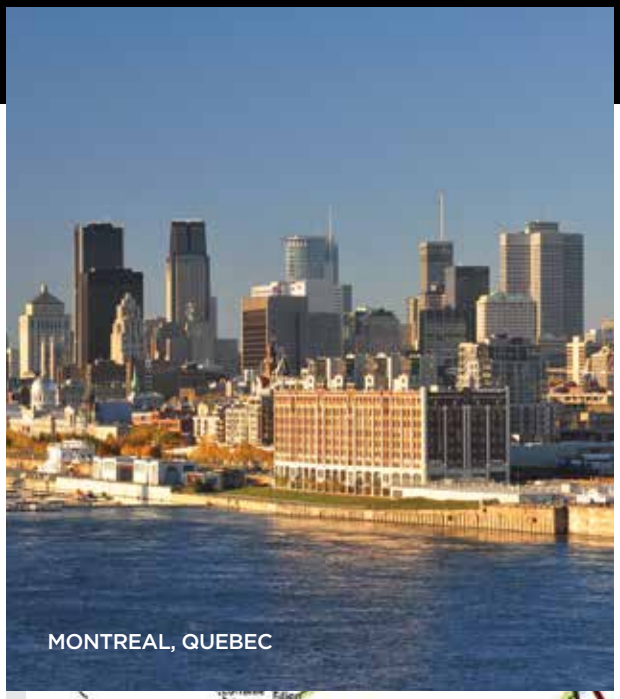
The pipeline route also crosses a significant groundwater recharge area in North Grenville. These areas are naturally formed and allow rain and melted snow to flow down into the aquifer easily. Given bitumen's propensity to separate from its diluents, a spill in this area could easily seep into the Oxford Aquifer, a risk that TransCanada ignores in its analysis.

TransCanada's lack of oversight is especially troubling given that a 2014 provincial study highlights the potential of a spill from a home heating fuel storage tank as a serious concern for potential contamination.[71] In 1991, in the nearby community of Manotick a tank containing the cancer-causing dry cleaning solvent PERC leaked, permanently poisoning 74 local wells. Manotick then spent millions of dollars to build a new water distribution system. The town still pipes its water from Ottawa because the local water supply still isn't safe, 22 years later.

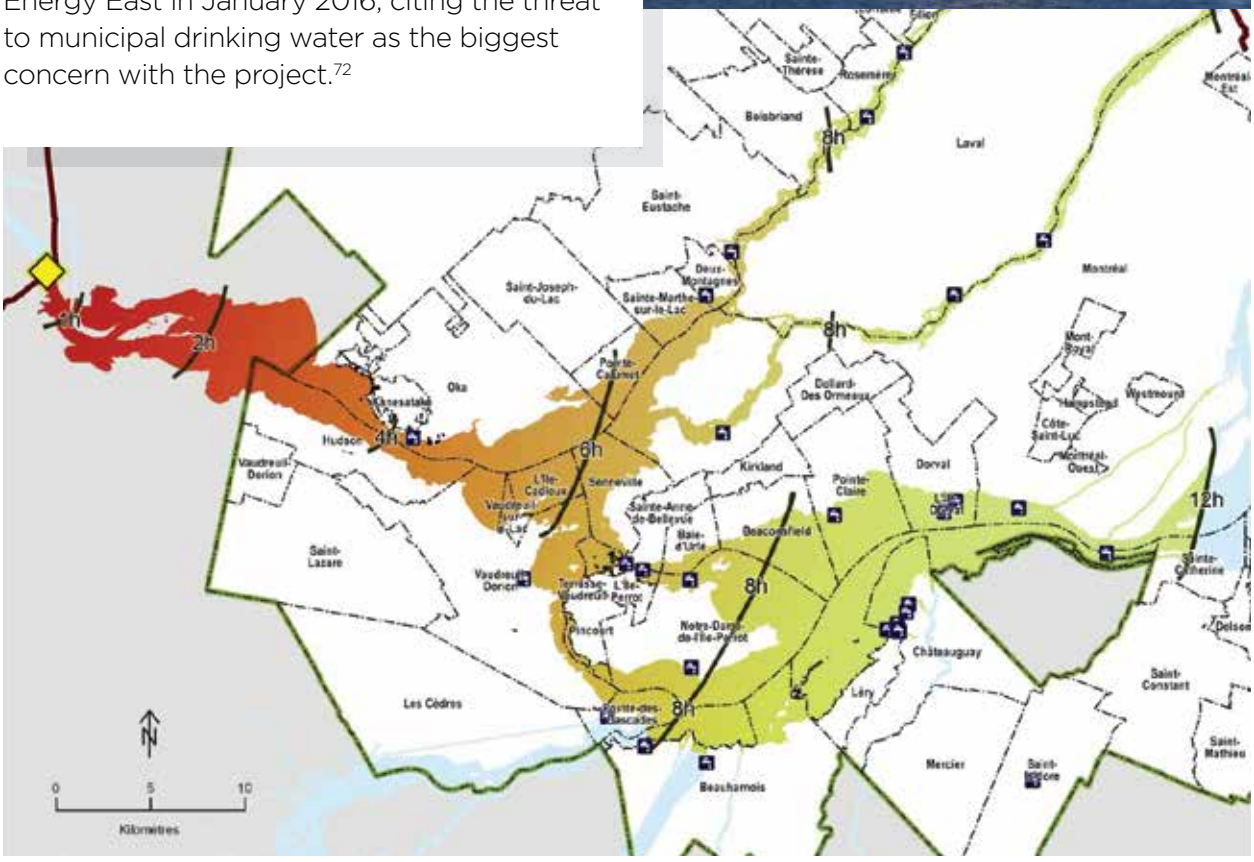
MONTREAL REGION

Energy East would cross parts of the greater Montreal area in a number of municipalities, including Mirabel, Sainte-Anne-des-Plaines, Terrebonne, Mascouche, Repentigny, L'Assomption, Saint-Sulpice, Laval and Montreal proper. The pipeline's proposed route would cross three important rivers in the region, Rivière des Outaouais (Ottawa River), Rivière des Mille Îles, and Rivière des Prairies (both are part of the Ottawa River system).

Extensive public consultations saw the 82 municipalities in the Communauté Métropolitaine de Montréal (CMM) reject Energy East in January 2016, citing the threat to municipal drinking water as the biggest concern with the project.[72]



MONTREAL, QUEBEC



OIL SPILL MODEL OF MONTREAL REGION SHOWING WATER CONTAMINATION DOWNSTREAM OF PROPOSED ENERGY EAST ROUTE[73]

MONTREAL REGION CONT'D

RIVIÈRE DES MILLE ÎLES

An expert analysis showed that drinking water intakes for Montreal, South Shore communities and Laval would be threatened by a spill.

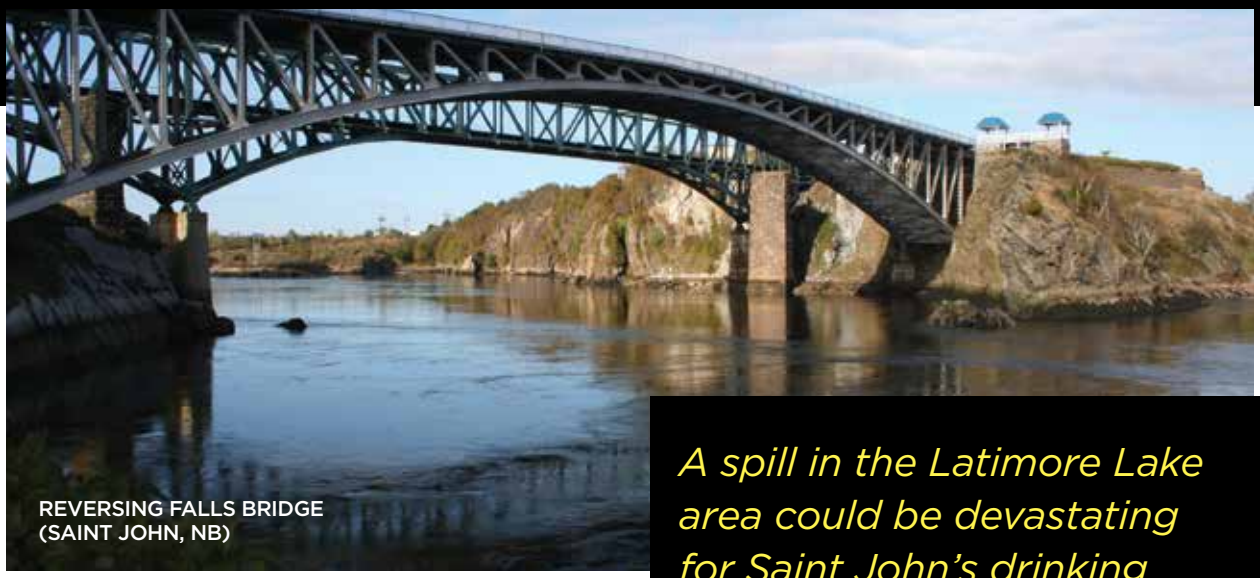
Their opposition was based on research of spill risks and impacts on water. Spill consequences are directly related to spilled pollutant volume, reaction time and response time.[74] Experts retained by the Communauté Métropolitaine de Montréal modelled the potential timespan for a spill spreading in the greater Montreal area as it would affect water intake points. The analysis showed that not only the City of Montreal, but also South Shore communities and the city of Laval's water intakes would be threatened.

If a significant spill were to occur, many drinking water intakes would be affected. According to the most recent route projections, the pipeline would cross the Rivière des Outaouais (Ottawa River), which provides drinking water to tens of thousands of residents of the Montreal region. Rivière des Milles Iles provides drinking water to 90,000 Terrebonne residents and 400,000 other residents in communities north of Montreal.

A recent study concluded that the proposed pipeline route north of the Saint Lawrence River would be at high risk from landslides due to unstable river banks in 19 locations.[75] Icy winter conditions on the rivers in the Montreal area would make any clean up even more difficult and costly.

There are many other economic and ecological costs associated with the risk of degraded water quality around Montreal in the case of a spill. Tourism as well as commercial traffic on the Saint Lawrence could be affected or interrupted. Agricultural and industrial sectors that rely on water supplied by one of these rivers would be impacted as well. Degraded water quality would have adverse impacts on water and land ecosystems. Likewise, any spill could impact the ecological services provided by the region's watersheds, such as carbon capture, flood prevention, heat wave mitigation, and pollination support. Together, these economic benefits have been valued at $4 billion per year. These were some of the risks highlighted by Montreal Mayor Denis Coderre on behalf of all 82 CMM municipalities as he explained the municipalities' opposition to the Energy East proposal.[76]

ST. JOHN RIVER AND NEW BRUNSWICK



REVERSING FALLS BRIDGE (SAINT JOHN, NB)

PHOTO: MACIEJ ŻMUDZIŃSKI

A spill in the Latimore Lake area could be devastating for Saint John's drinking water supply.

Over 60 per cent of New Brunswick residents rely on groundwater for their drinking water needs. The remainder source drinking water comes from surface waters, mostly lakes. The provincial government has legislation that aims to protect drinking water by way of Wellfield Protected Areas, (locations where water is drawn from aquifers to supply public water systems), and Watershed Protected Areas (locations where water is drawn from surface waters for public water systems).[77,78] The Wellfield Protection Designation Order includes three zones established around municipal wells as Wellfield Protected Areas; each zone is linked to prohibitions on certain land uses and practices that threaten to contaminate the drinking water. This includes limits on chemicals found in petroleum products including benzene and xylenes.[79] Similarly, the Watershed Area Protection Designation Order also establishes three zones around the watershed, or portions of the watershed, that supply public water systems, where developments, activities are reduced or prohibited.

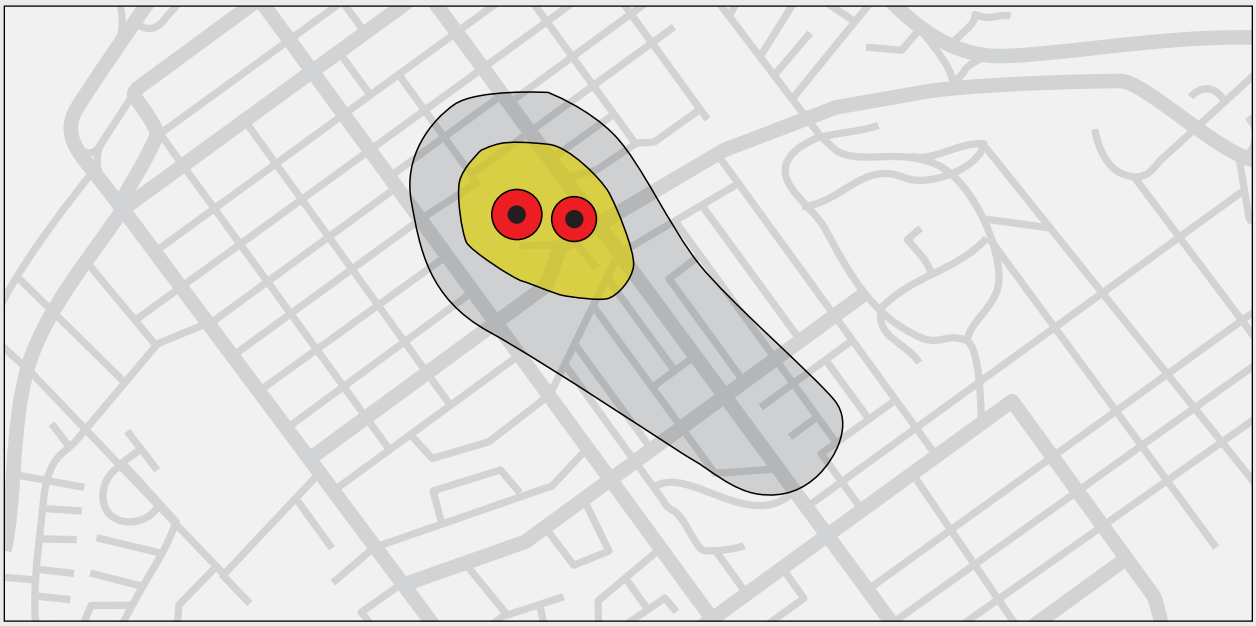
The St. John River acts as a recharge area for adjacent wellfields and watersheds that are important sources of drinking water for New Brunswick communities. Energy East would not cross the river directly, but it would cross a number of key tributaries like the Salmon River. The pipeline would run parallel to the Saint John River, creating additional spill risks.

A number of Wellfield Protected Areas are located beside the St. John River in places that could be contaminated by an upstream pipeline spill entering a tributary less than 30 kilometres away. This includes the drinking water sources for Edmundston, Grand Falls, Saint Anne de Madawaska and Saint Leonard. In these cases, the Saint John River is adjacent to the protected wellfields. A spill could wash ashore and present a threat of groundwater contamination through vulnerable recharge surface water. There are also concerns that some

SAINT JOHN AND NEW BRUNSWICK CONT'D

communities, such as Edmundston, may not have an alternative supply in the event of a contaminated wellfield.[80]

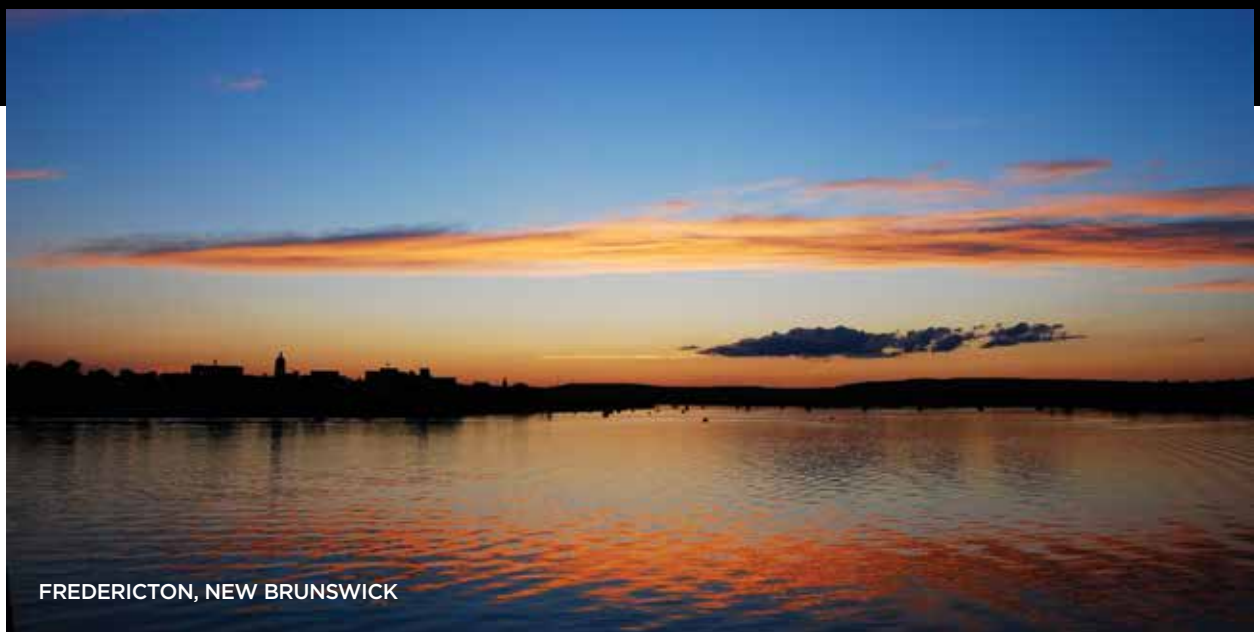
The pipeline path would also cross the Kennebecasis River around 12 km upstream of the community of Hampton and its ecologically unique marsh area. The municipality is home to significant agricultural land, some of which lies directly adjacent to the river.[81] The Hampton Marshes are known to flood during the spring run-off, with varying water levels through the year, and a spill during flooding threatens to be particularly damaging.[82] Private wells supply drinking water for the area, including rural wells near the pipeline route as well as wells



SAMPLE ILLUSTRATION OF A WELLFIELD PROTECTED AREA

- **Municipal Well**
- **Zone A:** This zone is closest to the wellhead and is the most environmentally sensitive. Within this zone the risk of contamination is greatest. The Designation Order states that septic tanks, sewer lines, petroleum products, chlorinated solvents, pesticides and similar chemicals or activities be controlled or in some cases, restricted within this zone.
- **Zone B:** The risk of bacterial contamination from land use is greatly reduced, but significant pollution risks still persist from petroleum products, chlorinated solvents and other persistent chemicals or activities.
- **Zone C:** Controls on some chemicals or activities are much less stringent in this zone but are still required for chlorinated solvents and petroleum products.

SAINT JOHN AND NEW BRUNSWICK CONT'D



FREDERICTON, NEW BRUNSWICK

near the river, raising contamination concerns in the event of a spill.[83] Despite concerns of local residents, TransCanada has refused to alter the pipeline path. Additionally, this part the Kennebecasis River is also under tidal influence from the Bay of Fundy. This means a spill in or near the crossing also threatens to contaminate Kennebecasis Bay, a fjord-like estuary of the St. John River.

In its information request to TransCanada, the City of Saint John notes that 45,000 of the city's 70,063 residents receive their drinking water from surface water taken from the Loch Lomond watershed on the city's most eastern reaches, east of the Reversing Falls Bridge. Preliminary mapping conducted by the Saint John City officials shows that a portion of the Energy East Pipeline will be located on a hill that abuts the eastern tip of the Loch Lomond watershed, traversing an area just 3 km outside the outer edge of the protected Loch Lomond Watershed Protected Area, where there are three intakes supplying water to the city of Saint John.[84] In the event of a leak or rupture, oil may flow downhill into the watershed.

Another planned pipeline crossing over the Mispec River would only be about three kilometres away from Latimore Lake, the location of another of Saint John's drinking water intakes.[85] A spill in this area could also be devastating for Saint John's drinking water supply.

Additionally, the City noted that 450 residents in the Harbourview Subdivision receive their drinking water from groundwater in wells located in the area. Harbourview Subdivision lies within the 3 km buffer zone from the proposed Energy East site. There is an existing Irving oil pipeline that runs through that provincially protected well field.

The City has invested in work to renew the water distribution system as well as build a new 75 million liter drinking water treatment plant, which Council plans to have operational in 2018.

UNDERSTANDING SPILL RISKS

Assessing and explaining the risks Energy East poses to local bodies of water and Canadians' drinking water supplies is one more area where TransCanada has obscured and downplayed the pipeline's potential negative impacts.

TransCanada submitted a superficial analysis to the National Energy Board that highlighted only what it considered to be risky water crossings.[86] It only considered locations where high current or low slope stability on an adjacent riverbank would threaten the stability of the underwater pipeline and could result in a pipeline leak or rupture. However, spill risks that could impact drinking water supplies are much more comprehensive. It is alarming that TransCanada ignored other spill risks like overland seepage, which are described in more detail below.

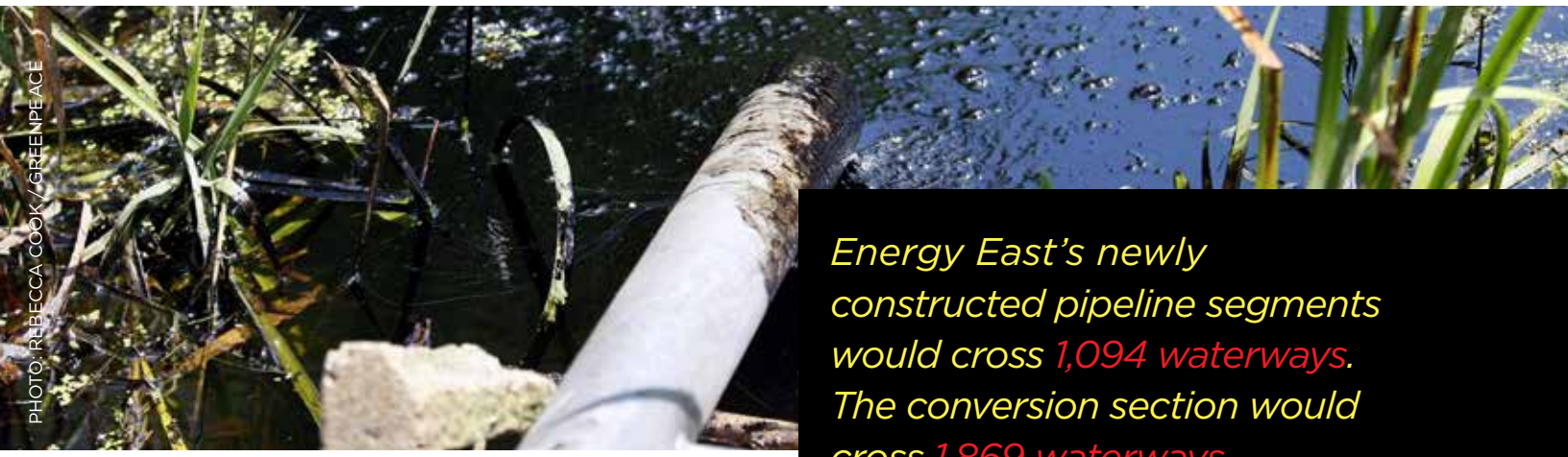


PHOTO: REBECCA COOK / GREENPEACE

Energy East's newly constructed pipeline segments would cross 1,094 waterways. The conversion section would cross 1,869 waterways.

WATERWAY SPILLS

In some cases, waterways would be directly at risk from the pipeline crossing either the source waterway upstream, or an upstream wetland or a tributary, which is akin to how the infamous Kalamazoo River spill began (in its tributary Talmadge Creek). In the event of a spill in a tributary waterway, oil would flow downstream and contaminate larger waterways. For example, drinking water for the Town of Nipigon near Lake Superior would be at risk from such a spill into the Nipigon River where the pipeline crosses upstream of the town.

In other areas, such as the small towns of Dégelis and Témiscouata-sur-le-Lac in eastern Quebec, the pipeline runs adjacent to the source waters for municipalities. A rupture could cause oil to seep into and pollute the drinking water supply.

Water crossings leave surface waters particularly vulnerable to spill risks. A spill that occurs where the pipeline crosses a major waterway could travel dozens, or even hundreds of kilometers, depending on the volume of the spill and the flow rate of the river.

TransCanada's application to build Energy East describes 1,094 separate water crossings for the new pipeline segments in New Brunswick, Quebec and Eastern Ontario – 102 of these occur within the 104 km of new construction in Ontario alone. In addition to these crossings, TransCanada also recognizes an additional 1,869 water crossings in the conversion section of the project. Within the conversion section, 36 crossings are being monitored for moderate to high hydrological hazards.[87]

Hazards may exist when river flows are high, when riverbanks are unstable or erode easily, and when water volumes in a river can rise rapidly due to high rainfall or snowfall events or breaching of upstream dams. Each of these factors has the potential to leave sections of pipe exposed, suspended in midair, and bearing unsustainable loads that can lead to pipeline failure.

One of the high hazard water crossings noted in TransCanada's application is the Wabigoon River in Northwestern Ontario. It provides drinking water to the downstream First Nations of Asubpeeschoseewagong (Grassy Narrows) and Wabaseemoong (Whitedog). These communities have been suffering for decades from mercury contamination from paper mill effluents dumped into the river in the mid-20th Century.[88] Now they face the new, additional threat of oil contamination from the proposed Energy East pipeline.

PHOTO: REBECCA COOK / GREENPEACE

OVERLAND RUPTURES

Overland ruptures, including land-based spills at pump stations, can contaminate surface and groundwaters, including shallow, vulnerable aquifers and wellfield protected areas as mobile oil components seep into the subterranean water table.

Surface Contamination
Surface lands and water are also at risk from spills, with remote areas being particularly sensitive to harm from undetected leaks. In 2015, a rupture of a one-year old Nexen pipeline in northern Alberta went undetected for weeks, spilling more than 5 million litres of an oil emulsion and devastating the surrounding forest and muskeg.[89]

Groundwater Contamination
Groundwater penetration of spilled oil will be greater in soils that are more porous or in bedrock that has many fissures and cracks. How spilled oil moves depends on factors like site slope, temperature (including whether the ground is frozen or not), vegetation cover, soil moisture content, and oil viscosity. Spills could behave differently depending on where they occur given that Energy East would cross very diverse terrain along its 4,600 km pathway.

In many parts of Ontario and Quebec the existing and proposed stretches of Energy East would run through hilly regions, especially near river escarpments where the land slopes toward drinking water source waterways. In southeastern Ontario, limestone substrates, called karst formations, are full of fissures and cracks that make groundwater aquifers particularly vulnerable to infiltration from surface chemical spills. In New Brunswick, Energy East would run above vulnerable, shallow water tables that form the basis of protected wellfield areas.[90]

Unexpected risks to waterways can also occur in areas where municipal storm sewers connect to nearby wetlands: On March 29, 2013, Exxon's overland Pegasus pipeline released an estimated 5,000 barrels of tar sands crude in a residential neighbourhood in Mayflower, Arkansas. Despite first responders' efforts, the oil flowed through storm drains to Lake Conway, contaminating the popular fishing area.[91]

According to the National Energy Board, TransCanada has the worst safety record among natural gas pipeline operators in Canada with 17 ruptures since 1992.

ADDITIONAL RISKS FOR ENERGY EAST

ENERGY EAST'S RISKY PIPELINE ROUTE

The risk Energy East poses to waterways and municipal drinking water supplies also stems from its route design. TransCanada plans to convert 3,000 kilometres of existing natural gas pipelines that were never built to carry oil.

Experts retained by the Ontario Energy Board (OEB) confirmed exactly that: The conversion portion of Energy East's route, the decades-old Canadian Mainline gas pipeline, was not designed to mitigate environmental impacts (this relates to the proposed Energy East route in Saskatchewan, Manitoba and most of Ontario). Consultants from Det Norske Veritas (Canada) recommended to the OEB that TransCanada be required to provide source water protection plans for high profile areas, watercourse management plans for water crossings, and to reroute the pipeline away from particularly sensitive water resources throughout Ontario and especially away from the St. Lawrence River.[92]

TransCanada has indicated that project details related to several water crossings are not due to be filed with the National Energy Board until the end of 2016. The company has made no indication of whether or not it intends to comply with the OEB's recommendations.

TRANSCANADA'S PROBLEMATIC SPILL RECORD

The threat to drinking water from Energy East exists across Canada, both where there is new construction proposed and where the existing natural gas pipeline is slated for conversion.[93] Especially worrisome is TransCanada's track record with such conversion/construction pipeline projects.

TransCanada's tar sands pipeline Keystone 1, running from Alberta to Illinois, is a very similar oil pipeline involving a converted gas pipeline segment and an add-on new pipeline section. In its first two years of operation, Keystone 1 leaked numerous times.[94] Canadian Transportation Safety Board data reveal that there were 71 leaks on the Canadian portion of the Keystone system between June 2010 and February 2012.[95, 96]

After only two years in operation, a section of Keystone 1 pipeline's wall was found to be 95 per cent corroded, leaving the pipeline paper thin at a location mere feet from the Mississippi River.[97]

TransCanada's natural gas pipelines also have troubling safety track records. According to the National Energy Board, TransCanada has the worst safety record among natural gas pipeline operators in Canada with 17 ruptures since 1992.[98] Almost half of these ruptures took place in the past six years.

TransCanada's Mainline system of natural gas pipelines, which includes the pipe planned for conversion to oil for the Energy East project, is no exception. The Transportation Safety Board reported 10 serious ruptures in the Mainline system since 1992.[99]

TransCanada claims that the planned electronic monitoring system for Energy East will enable the company to promptly identify and respond to leaks, but the company's record casts doubt on these claims. Of the 10 ruptures on TransCanada's Mainline system, only one was first identified by the leak detection system. The others were discovered by TransCanada staff on the ground, the general public, and a passing Ontario Provincial Police officer. Fully cutting off natural gas supply to a rupture took between 10 minutes to 2.5 hours. In one case, gas continued to flow into the isolated segment of pipeline for a total of 6 hours.[100]

TransCanada's planned leak detection system could still leave a spill of up to 2.6 million litres per day undetected.

Even if Energy East's leak detection system works reliably, there is still a massive problem. A large-scale spill would still be possible as the proposed leak detection system can only detect leaks greater than 1.5 per cent of the pipeline's capacity.[101] Based on a total capacity of 1.1 million barrels per day, an undetected leak of 1.5 per cent could release up to 16,500 barrels or 2.6 million litres of oil in a single day.

CONCLUSION

A close look at the planned pipeline route and local drinking water systems shows that more than five million Canadians face direct risks to their drinking water from the Energy East proposal.

This is a serious threat that millions of Canadians are being asked to accept from a pipeline project that would have marginal benefits for most Canadians. Given the sheer scale and complexity of the threat, there are no reasonable rerouting decisions or design tweaks that could adequately address the risks to drinking water sources across the route.

Canadians should reject the Energy East proposal, which puts the water we pour into our children's drinking glasses at risk.

The Energy East project is based on building a new pipeline through some of the most densely populated regions in the country like the Metropolitan Montreal Area, and repurposing thousands of kilometres of an aging natural gas pipeline that was not designed to transport oil and diluted bitumen. Because of the distances and geography across a 4,600 km distance, making tweaks to the pipeline route would not meaningfully reduce the threat or eliminate water-sensitive crossings,

Given the history of ruptures in TransCanada's existing natural gas Mainline system, there is good reason to expect future failures will result in the release of bitumen and other oil products into the natural environment. Due to the proximity of the pipeline to major municipal centres, this could easily lead to the contamination of source drinking water for cities, towns and communities in four provinces.

Protecting the safety of drinking water for millions of Canadians is not only a moral consideration as Canada weighs the risks of the Energy East proposal. In Ontario, it's a government obligation, enshrined in legislation following the Walkerton contaminated water crisis.[102]

Canada is known internationally for our pristine nature, including the very lakes, rivers and waterways that Energy East threatens. Ultimately, Canada's national interest is far better served by protecting our precious drinking water sources than it is in building a pipeline to export unrefined oil. Energy East would threaten the drinking water sources of many – all for the profit of a few oil companies. The risk to Canadians is not worth it.

Canadians should reject the Energy East proposal, which puts the water we pour into our children's drinking glasses at risk. Municipalities and First Nations communities should no longer be asked to risk our health, safety and environment for fossil fuel infrastructure Canada doesn't need.

A better option exists. Canadians should urge all levels of government to speed up Canada's transition to a modern, clean energy economy.

REFERENCES

1. McClain-Vanderpool, L., & Myott, R. (2015). Bridger pipeline release. United States Environmental Protection Agency. Retrieved from http://www2.epa.gov/region8/bridger-pipeline-release
2. Montana Department of Environmental Quality. (2015). Bridger pipeline's oil spill on the Yellowstone River near Glendive. Government of Montana. Retrieved from http://www.deq.mt.gov/yellowstonespill2015.mcpx
3. Palmer, B. (2015). 5 years since massive tar sands oil spill, Kalamazoo River still not clean. EcoWatch. Retrieved from http://ecowatch.com/2015/07/25/tar-sands-oil-spill-kalamazoo/2/
4. United States Environmental Protection Agency. (2015). EPA's response to the Enbridge oil spill. United States Environmental Protection Agency. Retrieved from http://www3.epa.gov/region5/enbridgespill/
5. Minnesota Water Science Center. (2015). Bemidji crude oil research project. United States Geological Survey. Retrieved from http://mn.water.usgs.gov/projects/bemidji/
6. Cozzarelli, I., Schreiber, M., Erickson, M., & Ziegler, A. (2015). Arsenic Cycling in Hydrocarbon Plumes: Secondary Effects of Natural Attenuation. [Abstract]. Groundwater. DOI: 10.1111/gwat.12316
7. Song, L. (2013). What sickens people in oil spill, and how badly, is anybody's guess. InsideClimateNews. Retrieved from http://www.bloomberg.com/news/2013-06-19/what-sickens-people-in-oil-spills-and-how-badly-is-anybody-s-guess.html
8. Eykelbosh, A. (2014). Short- and long-term health impacts of marine and terrestrial oil spills. Vancouver Coastal Health. Retrieved from https://www.vch.ca/media/VCH-health-impacts-oil-spill.pdf
9. United States Environmental Protection Agency. (2015). EPA's response to the Enbridge oil spill. United States Environmental Protection Agency. Retrieved from http://www3.epa.gov/region5/enbridgespill/
10. Environment Canada, Fisheries and Oceans Canada & Natural Resources Canada. (2013). Properties, Composition and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands. Government of Canada. Retrieved from http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=D6AB8B67-73F5-48B6-B3D1-AAE1B06FF9A2
11. Dew, W., Hontela, A., Rood, S. & Pyle, G. (2015). Biological effects and toxicity of diluted bitumen (dilbit) and its constituents in freshwater systems. Journal of Applied Toxicology, 35(11), 1219-27. doi: 10.1002/jat.3196
12. McGowan, E., Song, L. (2011) The Dilbit Disaster: Inside The Biggest Oil Spill You've Never Heard Of. Inside Climate News. Retrieved from http://insideclimatenews.org/news/20120626/dilbit-diluted-bitumen-enbridge-kalamazoo-river-marshall-michigan-oil-spill-6b-pipeline-epa
13. The National Academie of Sciences. (2015) Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response. Committee on the Effects of Diluted Bitumen on the Environment. Board on Chemical Sciences and Technology: Division on Earth and Life Sciences. Retrieved from http://www.nap.edu/download.php?record_id=21834#
14. TransCanada Corperation. (2015) Dilbit, what is it? Blog Post. Retrieved from https://blog.transcanada.com/dilbit-what-is-it/#sthash.DxgYfGUe.IskruQQ7.dpbs
15. Based on a review of Transportation Safety Board of Canada Pipeline Investigation Reports, retrieved from http://www.tsb.gc.ca/ eng/rapports-reports/pipeline/index.asp as reported in:
Council of Canadians. (2014). Energy East: When the pipeline spills... Retrieved from http://canadians.org/sites/default/files/publications/EE-Safety-Briefing.pdf
16. Transportation Safety Board. (2016). Pipeline occurrence data from January 2004. Government of Canada. Retrieved from http://www.tsb.gc.ca/eng/stats/pipeline/index-ff.asp

17. United States Environmental Protection Agency. (2015). EPA's response to the Enbridge oil spill. United States Environmental Protection Agency. Retrieved from http://www3.epa.gov/region5/enbridgespill/

18. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Government of Quebec. Retrieved from: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp)

19. Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada: Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf

20. City of Saint John. (December 2015). Informal Information Request to TransCanada Regarding the Energy East Project Pipeline Project. Retrieved from http://www.saintjohn.ca/en/home/news/newsreleases/city-of-saint-john-releases-informal-information-r.aspx

21. City of Portage la Prairie. (2010). City of Portage la Prairie Public Water System Annual Report for 2010. Retrieved from http://www.city-plap.com/main/download/sitefiles/water_treatment/2010PublicWaterSystemAnnualReport.pdf

22. City of Winnipeg Water and Waste Department. (2015). Shoal Lake and Winnipeg's Drinking Water. Retrieved from http://www.winnipeg.ca/waterandwaste/water/shoalLake.stm

23. Genivar, Stantec & Associated Engineering. (2015). Assiniboine River Water Demand Study. Manitoba Conservation and Water Stewardship. Retrieved from http://www.parc.ca/rac/fileManagement/upload/2ARWDS_Final_Report_April_23_2012.pdf

24. Manitoba Energy Justice Coalition. (2015). Potential Impacts of the Energy East Pipeline on the City of Winnipeg. Retrieved from http://noenergyeastmb.org/wp-content/uploads/2015/05/potential_impacts_energy_east_winnipeg_leneveu_mejc-2-MR_jh_may25.pdf

25. Lake of the Woods Water Sustainability Foundation. (2015). Map Service Showing the Lake of the Woods – Rainy River Basin". Retrieved from http://www.lowwsf.com/watershed-map.html

26. Energy East Pipeline Ltd. (2014). Energy East Project Application Volume 12 – Overview Maps. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=2543059&objAction=browse&viewType=1

27. City of Kenora. (2013). City of Kenora Water Treatment and Distribution System Drinking Water Quality Management Plan Operational Plan. Retrieved from http://www.kenora.ca/media/102752/operational_plan_-_water_treatment.pdf

28. Environment Canada. (2015). Nipigon Bay Area of Concern. Government of Canada. Retrieved from https://www.ec.gc.ca/raps-pas/default.asp?lang=En&n=62865611-1

29. Ontario Ministry of Environment and Climate Change. (2012). Nipigon Drinking Water System. Government of Ontario. Retrieved from http://www.downloads.ene.gov.on.ca/files/dwo/report/system_dws=220000246.html

30. North Bay – Mattawa Conservation Authority. (2015). North Bay – Mattawa Source Protection Area Source Protection Plan. North Bay – Mattawa Source Protection Committee. Retrieved from http://actforcleanwater.ca/uploads/NBM_SP%20Plan-Approved%2020150305.pdf

31. Energy East Pipeline Ltd. (2014). Energy East Project Application Volume 12J: Detailed Route Maps – North Bay Shortcut & Ontario East Segments – Sheet 48 to Sheet 55". Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2543059/Vol_12J_Detailed_Route_Maps%2DAppend_Vol_12%2D70_to_12%2D73%2C_North_Bay_Shortcut_and_ON_East_Segment_%2D_A4E0Y8.pdf?nodeid=2543134&vernum=-2

32. Town of Arnprior. (2013). Arnprior Water Filtration Plant Annual Summary Report 2013. Retrieved from

http://arnprior.ca/wp-system/uploads/2013/12/WTP-summary-20131.pdf

33. Town of Arnprior. (2014). Town of Arnprior Walter E. Prentice Water Filtration Plant and Distribution System Drinking Water Quality Management Standard Operational Plan. Retrieved from http://arnprior.ca/wp-system/uploads/2013/12/DWQMS-Operational-Plan-Web-Version-January-21-2015.pdf

34. Mississippi-Rideau Source Protection Region Rideau Valley Conservation Authority Office. (2014). Mississippi – Rideau Source Protection Plan. Rideau Valley Conservation Authority and Mississippi Valley Conservation Authority. Retrieved from http://www.mrsourcewater.ca/en/library/reports/item/17-mississippi-rideau-source-protection-plan

35. See the Methodology section and Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada: Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf

36. Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada: Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf

37. Jaques Harvey - JHarvey Consultants & Associés, Stéphanie Allard -ÉCOgestion-solutions (2015). Rapport D'information : Les Impacts Du Projet Oléoduc Énergie Est De Transcanada Dans La Mrc De D'autray. 104 p. http://www.covivia.com/img/courriels/2015/02/18_RapportImpact.pdf

38. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

39. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

40. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

41. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

42. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

43. Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

44. Xylem Water Solutions. (2014). Emergency Response Saves City of Lévis' Water Supply. Retrieved from http://www.xylemwatersolutions.com/scs/canada/en-ca/applications/CaseStories/Documents/Emergency%20response%20saves%20City%20of%20Levis%20water%20supply.pdf, http://www.obvcapitale.org/plans-directeurs-de-leau-2/2e-generation/introduction2e/section-5-activites-humaines-utilisation-du-territoire-et-usages-de-leau/usages-, Ministère du Développement durable, Environnement et Lutte contre les changements climatiques (2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

45. Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada: Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf, Ministère du Développement durable, Environnement et Lutte contre les changements climatiques

(2012). Répertoire de tous les réseaux municipaux de distribution d'eau potable. Gouvernement du Québec. Consulté à l'adresse: http://www.mddelcc.gouv.qc.ca/eau/potable/distribution/index.asp

46. Cassidy, J. (2015). Eau potable: la mise à niveau attend toujours. TVA – CIMT.ca. CIMT Teleinterrives. Retrieved from http://cimt.teleinterrives.com/nouvelle-Regional_Eau_potable_la_mise_a_niveau_attend_toujours-20087

47. Duman, J. (2014). Problème d'eau potable à Notre-Dame-du-Lac: une solution retenue. TVA – CIMT.ca. CIMT Teleinterrives. Retrieved from http://cimt.teleinterrives.com/nouvelle-Regional_Probleme_d_eau_potable_a_Notre_Dame_du_Lac_une_solution_retenue-13776

48. Duval, G. (2015). Témiscouata-sur-le-Lac ne veut pas d'oléoduc. Acadienouvelle. Retrieved from http://www.acadienouvelle.com/actualites/2015/10/05/temiscouata-sur-le-lac-ne-veut-pas-doleoduc/?pgnc=1

49. Pellerin, C. (2013). Inauguration de l'usine de traitment d'eau potable de Dégelis. TVA – CIMT.ca. CIMT Teleinterrives. Retrieved from http://cimt.teleinterrives.com/nouvelle-Regional_Inauguration_de_l_usine_de_traitement_d_eau_potable_de_Degelis-3817

50. Union des Municipalités du Québec. (2009). Eau Potable: Alimentation et production d'eau potable à Dégelis. Retrieved from http://www.umq.qc.ca/nouvelles/actualite-municipale/eau-potablealimentation-et-production-d-eau-potable-a-degelis/

51. City of Edmunston. (2015). Public Works and Environment – Water and Sewage. Retrieved from http://edmundston.ca/en/services-aux-citoyens/travaux-publics-et-environnement

52. Department of the Environment and Local Government. (2001). Schedule A-9: Protected Areas – Iroquois River Watershed – Edmundston". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Watershed-BassinsHydrographiques/edmundston-iroquois.pdf

53. International Joint Commission. (2015). St. John River Basin. Retrieved from http://ijc.org/en_/St._John_River_Basin

54. Department of the Environment and Local Government. (2009). Schedule A-34.1: Wellfield Protected Areas – Edmunston. Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Wellfield-ChampsDeCaptage/edmundston.pdf

55. Department of the Environment and Local Government. (2000). Schedule A-9: Wellfield Protected Areas – Town of St. Leonard". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Wellfield-ChampsDeCaptage/stleonard.pdf

56. Department of the Environment and Local Government. (2003). Schedule A-11: Wellfield Protected Areas – Village of Sainte-Anne-de-Madawaska". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Wellfield-ChampsDeCaptage/madawaska.pdf

57. Department of the Environment and Local Government. (2002). Schedule A-9: Wellfield Protected Areas – Town of Grand Falls". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Wellfield-ChampsDeCaptage/grandfalls.pdf

58. Hydro-Com Technologies – R.V. Anderson Associates Ltd. (2008). Water Availability of the Canaan River - Washademoak Lake Watershed. Environment and Sustainable Development Research Center – University of New Brunswick. Retrieved from http://nbwatersheds.ca/cwwa/images/documents/081612-20080818--WashademoakLakeReportFinalReport.pdf

59. Fletcher, C. & Water Planning Working Group. (2006). Hampton Water Planning Study Community Involvement." Town of Hampton. Retrieved from http://www.townofhampton.ca/assets/Uploads/Water-Management-Plan-2006/Water-management-plan-2006.pdf

60. Department of the Environment and Local Government. (2005). Schedule A-21: Wellfield Protected Areas – City of Fredericton". Government of New Brunswick. Retrieved from http://www2.gnb.ca/

content/dam/gnb/Departments/env/pdf/Water-Eau/Wellfield-ChampsDeCaptage/Fredericton.pdf

61. Department of the Environment and Local Government. (2001). Schedule A-25: Protected Areas – Loch Lomond Watershed - City of Saint John". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Watershed-BassinsHydrographiques/saint.john-loch.lomond.pdf

62. City of Saint John. (December 2015). Informal Information Request to TransCanada Regarding the Energy East Project Pipeline Project. Retrieved from http://www.saintjohn.ca/en/home/news/newsreleases/city-of-saint-john-releases-informal-information-r.aspx

63. Content for this case study comes from LeNevue, D. & Manitoba Energy Justice Coalition. (2015). Potential Impacts of the Energy East Pipeline on the City of Winnipeg. Retrieved from http://noenergyeastmb.org/wp-content/uploads/2015/05/potential_impacts_energy_east_winnipeg_leneveu_mejc-2-MR_jh_may25.pdf

64. CTV News Winnipeg. (2014). City admin asks for $1M to study impact of Energy East pipeline. Retrieved from http://winnipeg.ctvnews.ca/city-admin-asks-for-1m-to-study-impact-of-energy-east-pipeline-1.2118215

65. News Net Ledger. (2013). Earthquake Recorded West of Terrace Bay on Friday. Retrieved from http://www.netnewsledger.com/2013/01/26/earthquake-recorded-west-of-terrace-bay-on-friday/

66. Dodds, R. B., Burak, J.P. & Eigenbrod, K.D. (1993). Nipigon River Landslide. Tech. no. 2.49, Proceedings: Third International Conference on Case Histories in Geotechnical Engineering, St. Louis, Missouri, June 1-4, 1993. Retrieved from http://scholarsmine.mst.edu/cgi/viewcontent.cgi?article=2137&context=icchge

67. CBC News. TransCanada pipeline precautions 'not good enough' for Nipigon (2014). Retrieved from http://www.cbc.ca/news/canada/thunder-bay/transcanada-pipeline-precautions-not-good-enough-for-nipigon-1.2692028

68. Aulakh, R. (2014) . North Bay residents up in arms over TransCanada plan to switch crude oil for gas in local pipeline.Toronto Star. Retrieved from http://www.thestar.com/news/world/2014/09/28/north_bay_residents_up_in_arms_over_transcanada_plan_to_switch_crude_oil_for_gas_in_local_pipeline.html

69. Angus, I. (2013). TransCanada Pipeline Plan Threatens Drinking Water. Climate & Capitalism. Retrieved from http://climateandcapitalism.com/2013/09/25/pipeline-threatens-drinking-water/

70. Energy East Pipeline Ltd. (2014). Energy East Project Application Volume 6: Accidents and Malfunctions, Section 4: Sites of Interest, 1. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2543068/ESA_V6_S4_SitesOfInterest_-_A4E1F5.pdf?nodeid=2543268&vernum=-2

71. Nikiforuk, A. (2014). Record Bitumen Seepage in Alberta Continues Unabated. The Tyee. Retrieved from http://thetyee.ca/News/2014/02/08/Bitumen-Seepage-Alberta/

72. Quinte Source Protection Plan. (2014). Retrieved from http://quintesourcewater.ca/site/images/stories/Threats_Backgrouonders/21_prescribed_threats.pdf

73. Communauté Métropolitaine de Montréal. (2015). Rapport du consultation public de la commission de l'environnement: Project Oléoduc Energie Est TransCanada. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20160121_transCanada_RapportConsultation.pdf

74. Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada: Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf

75. Savaria Experts Environnement. (2015). Mise en Service de L'Oleoduc Énergie Est de TransCanada:

Impacts d'un déversement sur le territoire de la Communauté métropolitaine de Montréal. Retrieved from http://cmm.qc.ca/fileadmin/user_upload/documents/20150514_oleoduc-energie-est_rapport.pdf

76. Shields, A. (2015). Le pipeline Énergie Est traverserait 256 cours d'eau du Québec. Le Devoir. Retrieved from http://www.ledevoir.com/environnement/actualites-sur-l-environnement/442707/le-pipeline-energie-est-traverserait-256cours-d-eau-du-quebec

77. David Suzuki Foundation. (2013). Le capital écologique du Grand Montréal : Une évaluation économique de la biodiversité et des écosystèmes de la Ceinture Verte. Retrieved from www.davidsuzuki.org/fr/publications/telechargements/2012/Rapport%20Ceinture%20Verte_BSE_FDS_web_Fev2013.pdf

78. New Brunswick Clean Water Act, Statutes of New Brunswick, (2001-83, c. 6-1). Retrieved from http://laws.gnb.ca/en/showpdf/cr/2001-83.pdf

79. Department of the Environment and Local Government. (2005). "An Overview of New Brunswick's Wellfield Protection Program". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/WellfieldProtection.pdf

80. Kennebecasis Watershed Restoration Committee. (2013). Kennebecasis Watershed. Government of New Brunswick. Retrieved from http://kennebecasisriver.ca/watersheds.html

81. CTV Atlantic. (2014). N.B. residents in flood-prone areas urged to monitor water levels. CTV Atlantic. Retreived from http://atlantic.ctvnews.ca/n-b-residents-in-flood-prone-areas-urged-to-monitor-water-levels-1.1772557

82. Fletcher, C. & Water Planning Working Group. (2006). Hampton Water Planning Study Community Involvement." Town of Hampton. Retrieved from http://www.townofhampton.ca/assets/Uploads/Water-Management-Plan-2006/Water-management-plan-2006.pdf

83. Department of the Environment and Local Government. (2001). Schedule A-25: Protected Areas – Loch Lomond Watershed - City of Saint John". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Watershed-BassinsHydrographiques/saint.john-loch.lomond.pdf

84. Google Maps. (2015). Proposed water crossings by Energy East Pipeline in New Brunswick. Retrieved from https://www.google.com/maps/d/viewer?mid=zmYHa1khyGs0.kJjNH1wURtPU

85. Department of the Environment and Local Government. (2001). Schedule A-25: Protected Areas – Loch Lomond Watershed - City of Saint John". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Watershed-BassinsHydrographiques/saint.john-loch.lomond.pdf

86. Energy East Pipeline Ltd. (2015). NEB Information Request 5 Response: Attachment NEB 5.20-1 Phase II Hydrotechnical Hazards Assessment. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=2858155&objAction=browse

87. Energy East Pipeline Ltd. (2015). Energy East Project Response to NEB No. 5 Information Request, Section 5.20 – Hydrological Hazards Assessment Report by Golder Associates. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll?func=ll&objId=2858155&objAction=browse&viewType=1

88. Porter, J. (2015). Mercury levels still rising near Grassy Narrows First Nation, report says. CBC News. Retrieved from http://www.cbc.ca/news/canada/thunder-bay/mercury-levels-still-rising-near-grassy-narrows-first-nation-report-says-1.3109261

89. The Canadian Press (2015) Nexen says Alberta oil pipeline started leaking as early as June 29. July 22, 2015. Retrieved from http://globalnews.ca/news/2124589/nexen-to-provide-update-on-large-oil-spill-in-northern-alberta/

90. Department of the Environment and Local Government. (2005). "An Overview of New Brunswick's Wellfield Protection Program". Government of New Brunswick. Retrieved from http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/WellfieldProtection.pdf

91. Lewis, J. (2015). Tests reveal tar sands in Lake Conway, Exxon denies. KATV Little Rock. Retrieved from http://katv.com/archive/tests-reveal-tar-sands-in-lake-conway-exxon-denies

92. Det Norske Veritas GL. (2015). Impacts to the Natural Environment preliminary assessment report. Ontario Energy Board. Retrieved from http://www.ontarioenergyboard.ca/html/oebenergyeast/documents/parttwo/Presentation_Natural%20Environment.pdf

93. Its rationale for doing this was that since the conversion "is not expected to involve in-water construction" and "is not expected to interact with surface water resources; therefore, no further assessment is warranted." Energy East Pipeline Ltd. (2014). Energy East Project Application Volume 2: Biophysical Effects Assessment, Part C1: Northern Ontario, 4-8. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2543237/ESA_V2_PC1_ON_S4_SurfaceWater_-_A4D9Z0.pdf?nodeid=2543239&vernum=-2.

94. Skinner, L. & Sweeney, S. (2012) The Impact of Tar Sands Pipeline Spills on Employment and the Economy. Cornell University Global Labor Institute, 5. Retrieved from http://www.ilr.cornell.edu/globallaborinstitute/research/upload/GLI_Impact-of-Tar-Sands-Pipeline-Spills.pdf

95. Transportation Safety Board. (2016). Pipeline occurrence data from January 2004. Government of Canada. Retrieved from http://www.tsb.gc.ca/eng/stats/pipeline/index-ff.asp

96. Energy East Pipeline Ltd. (2014). Energy East Project Application Volume 6: Accidents and Malfunctions, Section 4: Sites of Interest, 1. Retrieved from https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2543068/ESA_V6_S4_SitesOfInterest_-_A4E1F5.pdf?nodeid=2543268&vernum=-2

97. Dermansky, J. (2015). TransCanada Keystone 1 pipeline suffered major corrosion only two years in operation. DesmogBlog. Retrieved from http://desmogblog.com/2015/04/30/exclusive-transcanada-keystone-1-pipeline-suffered-major-corrosion-only-two-years-operation-95-worn-one-section

98. National Energy Board. (2016). Pipeline ruptures: Ruptures on NEB-regulated pipelines. Government of Canada. Retrieved from http://www.neb-one.gc.ca/sftnvrnmnt/sft/pplnrptr/index-eng.html

99. Based on a review of Transportation Safety Board of Canada Pipeline Investigation Reports, retrieved from http://www.tsb.gc.ca/eng/rapports-reports/pipeline/index.asp as reported in: Council of Canadians. (2014). Energy East: When the pipeline spills... Retrieved from http://canadians.org/sites/default/files/publications/EE-Safety-Briefing.pdf

100. Council of Canadians. (2014). Energy East: When the pipeline spills... Retrieved from http://canadians.org/sites/default/files/publications/EE-Safety-Briefing.pdf

101. Saint-Arnaud, P. (2015). Énergie-Est: Des fuites indétectables seraint possibles. Le Devoir. Retrieved from http://www.ledevoir.com/environnement/actualites-sur-l-environnement/430234/energie-est-une-premiere-etude-independante-montre-des-failles-de-securite

102. Ontario Clean Water Act, Statutes of Ontario, (2006, c. 22). Retrieved from https://www.ontario.ca/laws/statute/06c22.

environmental defence

ENVIRONMENTAL DEFENCE
116 Spadina Avenue, Suite 300
Toronto, Ontario M5V 2K6
tel 416 323-9521 | fax 416 323 9301
email info@environmentaldefence.ca

environmentaldefence.ca