

TRANS MOUNTAIN EXPANSION ANALYSIS

UNIVERSITY OF BRITISH COLUMBIA
CLIMATE JUSTICE RESEARCH COLLABORATIVE

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Thank you all endlessly.*

PREFACE

LAND ACKNOWLEDGEMENT

This project, was completed at the University of British Columbia (UBC), living and working on the unceded lands of the x̱w̱məθkʷəy̱əm (Musqueam people), Sḵwx̱wú7mesh Úxwumixw (Squamish Nation), and səliłwətał (Tsleil-Waututh Nation).

ABOUT US

The Climate Justice Research Collaborative (CJRC) program at UBC strives to participate in community-based research with Indigenous communities. While working alongside Dr. Mark Harris, an associate professor with a background in law and Indigenous rights, and Kelsey Sablan Martin, a graduate student with a focus in educational studies and Indigenous community-based research, our undergraduate team is composed of diverse educational disciplines. This report has been created in conjunction with an ArcGIS StoryMap, supported on the most-recent versions of desktop Chrome and Safari, and can be found here: <https://arcg.is/1Cemfr>

As UBC students, we enter this project with privileged access to academic data sources, software systems, and contacts. Though this allows us to progress confidently in our research, we are cognizant that we continue to have critical blindspots in our experiences as we are susceptible to neglecting the realities of how our work may impact our Indigenous community partners. As settlers working with Indigenous communities in a research setting, we acknowledge the importance that this work is not complete and must be continued. Furthermore, we recognize how our positionality impacts our community partners, the research we present within this paper, and the future work to be completed.

OUR TEAM:

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COMMUNITY PARTNERS

We express our gratitude as this research project has been co-created with the mentorship of:

- Elder Jim Leyden (The Mountain Protectors)
- Lynn Perrin (Pipe Up Network)
- Peter McCartney (The Wilderness Committee)
- Evan Thornberry (UBC GIS Librarian)
- Dr. Dana James (UBC Faculty of Land and Food Systems)

We want to profoundly thank our community partners for their shared knowledge, expertise, and guidance. In particular, this project has been created in response to the information gathered and concerns arisen by The Mountain Protectors, a group of Indigenous-led land defenders working to surveil and monitor Trans Mountain's actions at the Burnaby Terminal, alongside the Pipe Up Network and the Wilderness Committee, associate organising communities working to support the voice of grassroots communities.

DEFINITIONS

CRITICAL INFRASTRUCTURE (Public Safety Canada):

Critical infrastructure (CI) refers to processes, systems, facilities, technologies, networks, assets and services essential to the health, safety, security or economic well-being of Canadians and the effective functioning of government. CI can be stand-alone or interconnected and interdependent within and across provinces, territories and national borders. Disruptions of CI could result in catastrophic loss of life, adverse economic effects and significant harm to public confidence (Public Safety Canada, 2022).

CRITICAL INFRASTRUCTURE (Unist'ot'en Territory):

...[O]ur critical infrastructure is the clean drinking water, and the very water that the salmon spawn in, and they go back downstream in and [after] four years, come back. That salmon is our food source; it's our main staple food. That's one of our critical infrastructures...the bears eat the salmon as well, because once the salmon spawn, they end up dying anyways, and that becomes food for the bears, so it's not being wasted. All of that is part of the system that our people depend on, and that whole cycle and system is our critical infrastructure (Spice, 2018).

ABBREVIATIONS

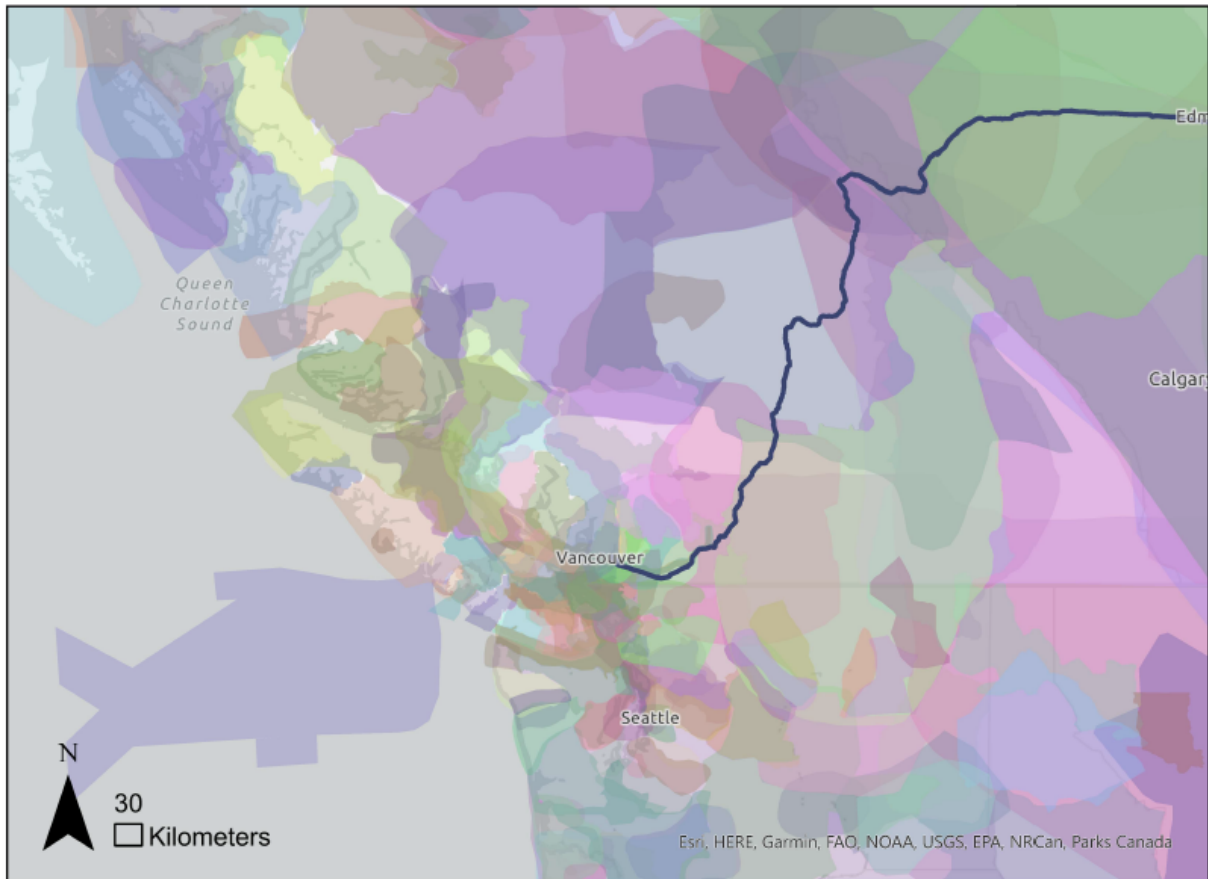
AIS: Automatic Identification System	m: Metre
CI: Critical Infrastructure	NRWK: Northern Resident Killer Whales
CJRC: Climate Justice Research Collaborative	SRWK: Southern Resident Killer Whales
Km: Kilometre	TMPL: Trans Mountain Pipeline System
cm: Centimetre	TMX: Trans Mountain Expansion

INDIGENOUS TERRITORY

Since time immemorial, Indigenous ideologies and perceptions of territory are entrenched on intentions of kinship, culture, and relations (Malone & Chisholm, 2016). Indigenous traditional territories (Figure 1) are of great significance, in addition to community and environmental connections, traditional territories are lands that hold relations to villages, hunting, harvesting grounds, spiritual areas, travelling, and trade routes.

Figure 1.

TMPL Intersecting Traditional Territories



NOTE: Figure 1). Trans Mountain Pipeline (extending from Edmonton, Alberta (AB) to Burnaby, British Columbia (B.C.)) intersection of Indigenous Traditional Territories. More information on traditional territories can be found here:

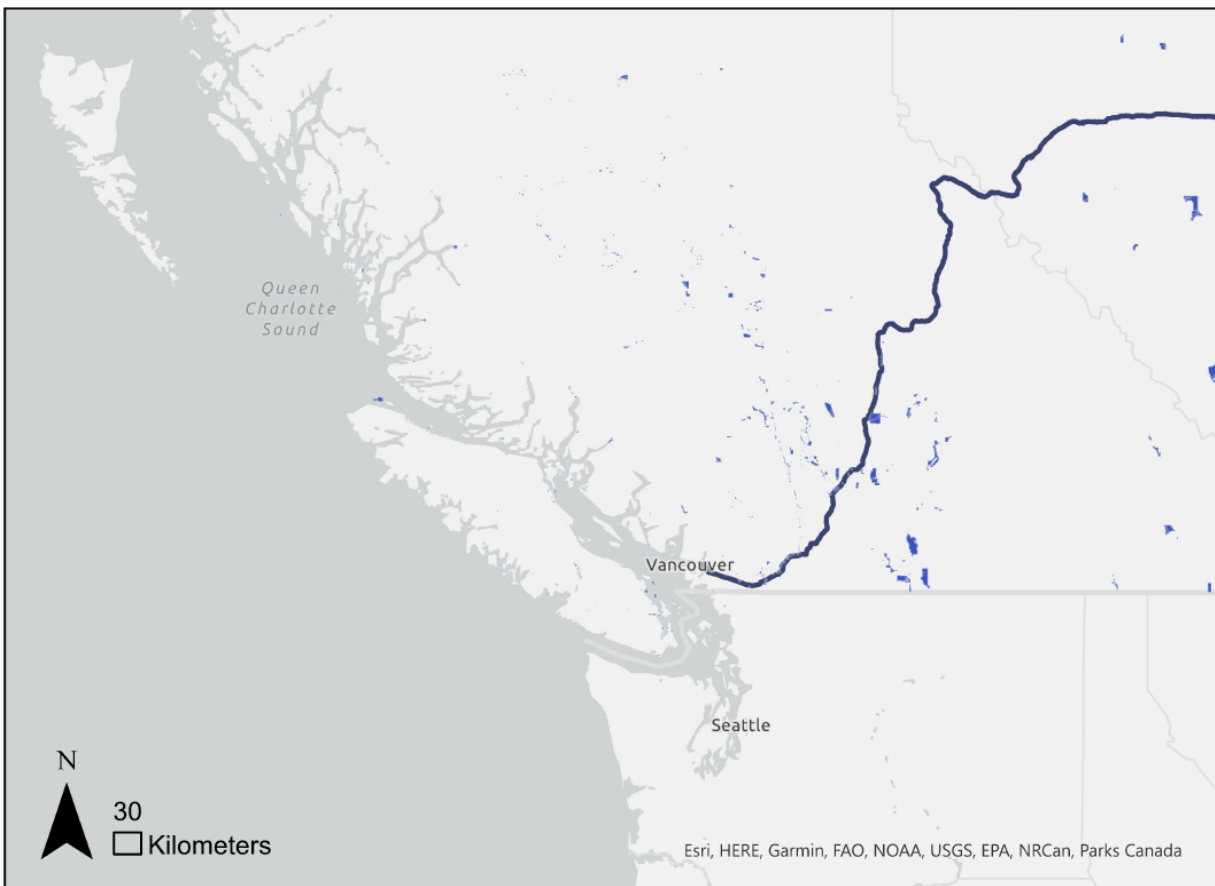
<https://arcc.is/1Cemfr> and <https://native-land.ca/>

The pipeline intersects the territories of: Stz'uminus Skwxwú7mesh-ulh Temíxw (Squamish), šxʷməθkʷəy̓əməʔ təməxʷ (Musqueam), əlɪlwətaʔ təməxʷ (Tseil-Waututh), Hul'qumi'num Treaty Group, Qayqayt, S'ólh Téméxw (Stó:lō), Cayuse, Umatilla and Walla Walla kʷikʷəłəm, Stz'uminus, Sqəciyaʔ təməxʷ (Katzie), Kwantlen, Semiahmoo, Nleʔkepmx Tmíxʷ (Nlaka'pamux), Confederated Tribes of the Colville Reservation, Sylx (Okanagan), Secwepemcúl'ecw (Secwépemc), Ktunaxa ʔamakʔ, Íyāhé Nakón məkóce (Stoney), Mountain Métis, As'in'i'wa'chi Niy'aw Askíy (Rocky Mountain Cree), Lheidli T'enneh, Tsuut'ina, Michif Piyii (Métis), Cree, Kelly Lake Metis Settlement Society, and ɔ'Δʌ° <ɹʀ+ Nêhiyaw-Askíy (Plains Cree)

Legal, social-economic, and political events have generated and produced a delegitimization of Indigenous lands as traditional territories have been reconfigured into intangible reserve areas (Figure 2) (Hierro & Surralles, 2005). This settler and colonial operation has in turn, resulted in an over-exploitation of natural resources, loss of culture and security, and poverty (Hierro & Surralles, 2005). Reserve lands, specifically, are areas of land for use by Indian Bands and their members, laid out in treaty agreements and the Indian Act. The specified land is owned by the federal government, and administered by band councils (Hanson, n.d.). The Trans Mountain Pipeline intersects at least 15 reserve lands and 25 traditional territories (Figure 1; Figure 2). Indigenous anthropologist, Spice (2018), emphasises that the traditional territories which CI, such as pipelines, traverses through, has “never [been] surrendered to the Canadian state”(p.43).

Figure 2.

TMPL Intersecting Indigenous Reserves



NOTE: Figure 2). Trans Mountain Pipeline intersection (extending from Edmonton, AB to Burnaby, BC) of reserve lands. More information on reserve lands can be found here: <https://arcg.is/1Cemfr>

TRANS MOUNTAIN

HISTORY

In 1947, crude oil reserves were found in Leduc, Alberta. Bill 190 passed into legislation on April 5, 1949, by Lionel Chevrier constituting Canada's first pipeline act (Minister of Transport) (Kheraj, 2015). Bill 190 did not comprise of any provisions regarding environmental protection (Kheraj, 2020). During this time, Status Indians were prohibited from seeking legal consultation, fundraising "for land claims", organising in groups, or employing lawyers (Wilson & Hodgson, n.d.). Thus, while there were extensive findings and discoveries being made on Indigenous territory, there was a lack of consultation and decision-making with Indigenous communities. Moreover, the ability for Indigenous peoples to engage in legal discourse about the passing of legislation was denied.

On March 21st, 1951, The Canadian Parliament passed a private charter leading to the establishment of the Trans Mountain Oil Pipe Line Company. From then on, Trans Mountain began construction on the main pipeline between Edmonton, AB and Burnaby, B.C. – manufacturing a 1155.2km main line between the two cities (Kheraj, 2015). Roughly 30 months later, the first shipment of oil was received at the Burnaby terminal (Trans Mountain, 2018).

Ownership changes have been occurring throughout Trans Mountain's history. In 1994, Terasen Pipelines (BC Gas) acquired the TMPL, though it was soon handed off to Kinder Morgan in 2005. The Kinder Morgan acquisition was paired with inquiries and investigations towards a pipeline expansion, this received stark public reactions. After multiple years of trying to get approval and consent of local communities and governments, along with non-stop resistance from grassroots organisations and individuals, the Government of Canada purchased the TMPL for \$4.5 billion CAD. This purchase ensured the completion of the pipeline despite continuing resistance and concerns (Reeves & Baker, 2020). The current state of the project looks at a 470% increase in price, with the expected completion date of 2024.

TERMINALS: WESTRIDGE MARINE

The Westridge Marine terminal (Image 1, Image 2) has been in operation since 1956 and is located on the South Shore of the Burrard Inlet of Burnaby, BC. Currently, the terminal is undergoing an expansion to accommodate the TMX project. The terminal expansion project includes a new dock complex comprised of 3 berths, a utility dock, boom boats, emergency response vessels, and a land extension. Currently, the terminal can harbour 1 Aframax (245m) tanker, the expansion will increase the loading ability to 3 Aframax tankers (Trans Mountain, 2017c).

The expansion process will result in an increase of tanker traffic from roughly 60 per year to 408 per year to the Westridge Marine Terminal (Hospital et al., 2015). The terminal will serve up to 34 Aframax-class tankers and 3 barges a month. With the expansion of the Westridge Marine terminal, the impacts of shipping crude oil will severely increase. Impacts include oil, air, and plastic pollution, an increase in greenhouse gas emissions, effects on marine and land species (see Killer Whales: Impacts and Effects; Habitat Loss), and harmful health effects on local communities and Indigenous peoples (see Spills) (Vakili, 2020).

Images 1 and 2.

Westridge Marine Terminal



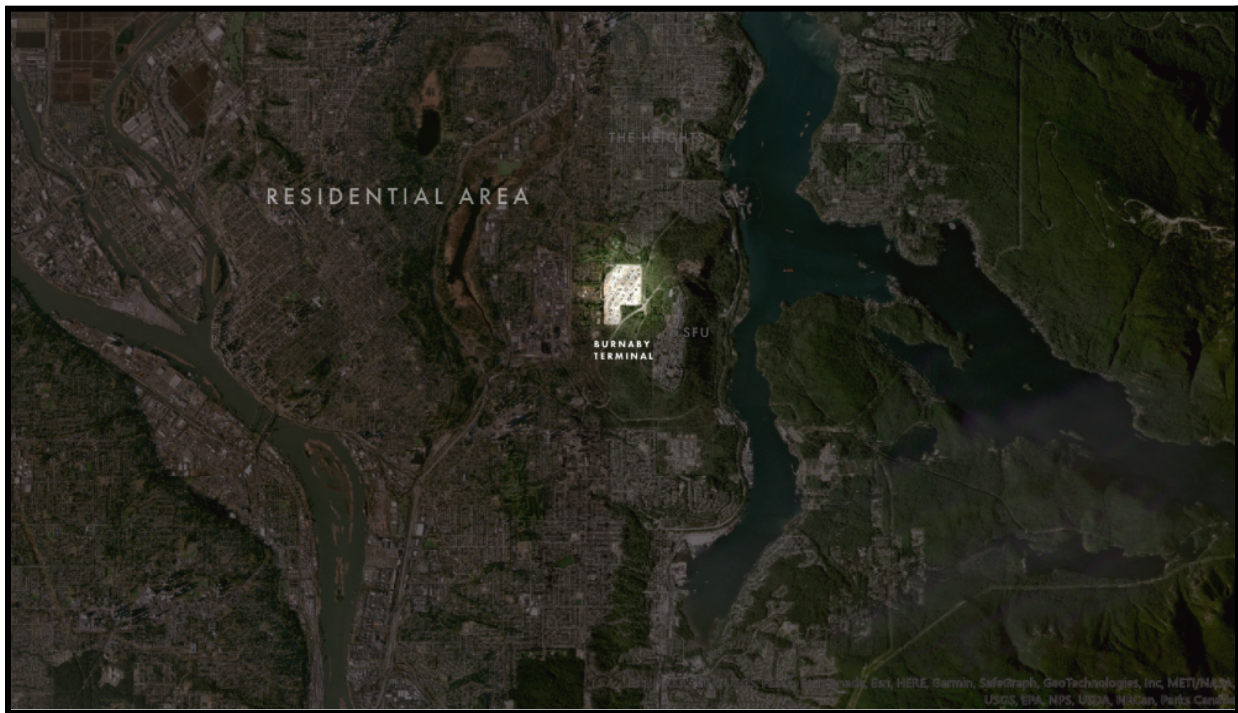
NOTE: Image 1 and 2). Westridge Terminal undergoing expansion. McCartney, Peter, 2021

TERMINALS: BURNABY TERMINAL

As the terminating point for the TMPL, the Burnaby Terminal first began distributing crude oil for the TMPL in 1953. The Burnaby Terminal serves as a distribution hub for refined and crude products to refineries in the lower mainland of British Columbia (Trans Mountain, n.d.). Since 2019, this terminal has been undergoing an expansion to compensate for the TMX project. In addition to the 13 existing tanks, 14 new tanks will be constructed, and 1 will be demolished. The Burnaby Terminal Tank Farm poses severe consequences due its immediate proximity (Figure 3, Image 3) to surrounding neighbourhoods, residential areas, and Indigenous communities, especially the Sel̓ilwítulh (Tsleil-Waututh), Sk̓wx̓wú7mesh (Squamish), and xʷməθkʷəy̓əm (Musqueam) peoples. Indigenous communities have long used the mountain as a site for harvesting, ceremonies, and living (EIC, 2017).

Figure 3.

Planet Basemap of the Burnaby Terminal along with a photograph of the terminal.



NOTE: Figure 3). Planet Imagery Basemap highlighting the Burnaby Terminal

Numerous concerns have arisen due to the aforementioned immediate proximity. Mayor Mike Hurley of Burnaby stated that the TMX project “poses an unacceptably high risk to local residents” (Scott, 2019). Moreover, residents and communities close to the Burnaby Terminal expressed concerns about explosions, pollution, fires, and spills (Boynton, 2019). Due to these risks and concerns, the tank farm has faced much resistance. Crucial to this project is the work of Elder Jim Leyden and the Kwekwecnewtxw (Watch House). Elder Jim Leyden is the Elder at the Watch House

and has been persecuted, much like other Indigenous land defenders, facing arrest, court orders, injunctions and jail time, as punishment for his work defending the land, air, and water (Gwley, 2020). The TMX injunction stands to prevent protestors from obstructing construction of the site; more than 230 guilty verdicts have been issued for its breach (Hermes, 2021).

Image 3.

Burnaby Terminal

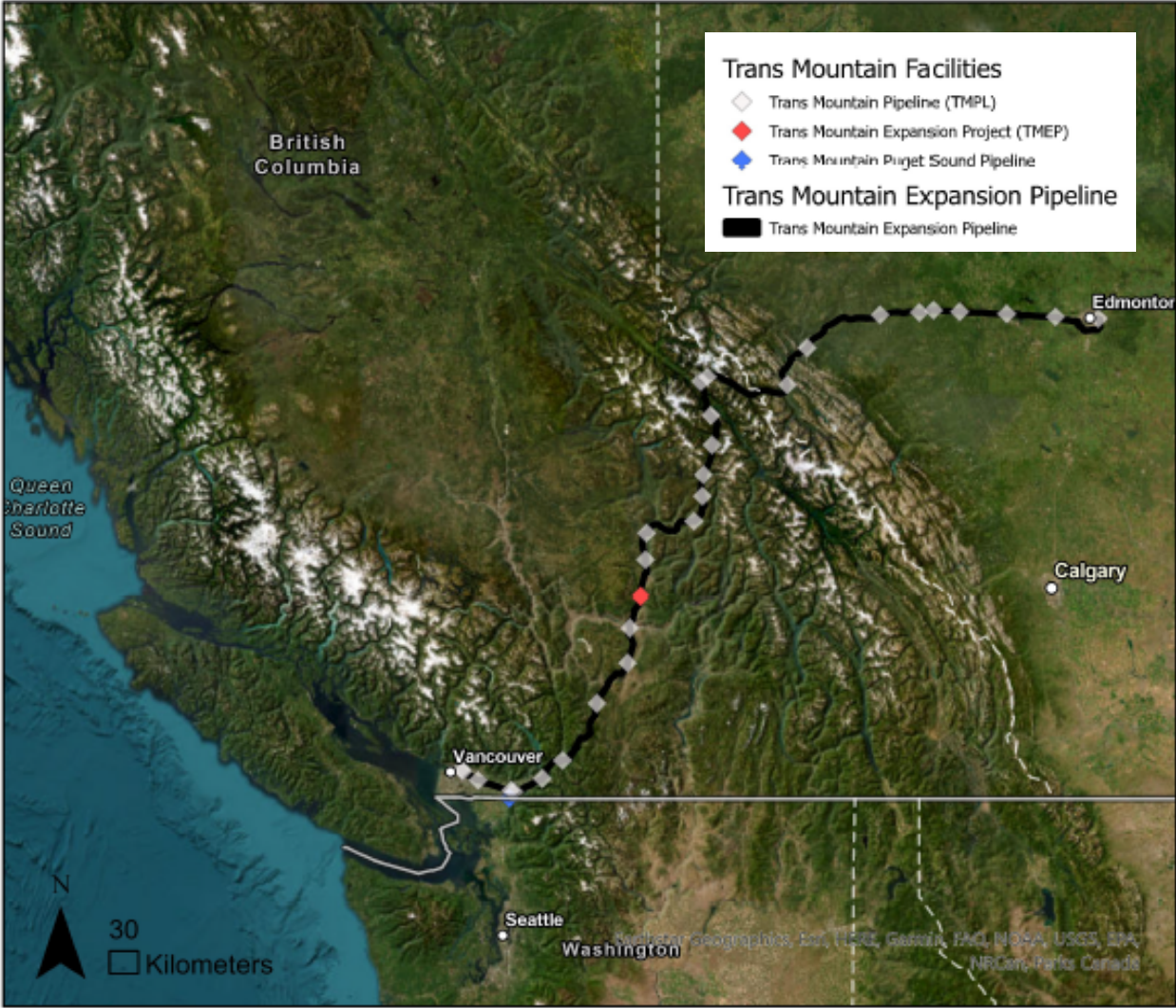


NOTE: Image 3) Photo of the Burnaby Terminal Expansion under construction. McCartney, Peter, 2021.

PUMPS AND FACILITIES

Following the \$4.5 billion CAD transaction between the Government of Canada and Kinder Morgan in 2018, the TMX project mostly follows the original TMPL route with few deviations., 11 pump stations are receiving expansions and an additional pump station is being constructed for the addition of the second pipeline (the Black Pines Station). Moreover, some sections of the pipeline are reactivated old pipe, however, most are new developments. The TMPL system alone involves around 1000 km of 61 to 91 cm diameter pipes, while the TMX system involves an additional 1185 km of pipe ranging from 91 to 122 cm diameter pipes. The project will see an increase from around 300,000 barrels a day to roughly 890,000 barrels a day (Trans Mountain, 2017a; Trans Mountain, 2023).

Figure 4.
Pumps and Facilities Among the TMX Route



NOTE: Figure 4). Trans Mountain facilities for the TMPL and TMX (red pump added) projects. Shown along the TMX route from Edmonton, AB to Burnaby, B.C.

SPILLS

INTRODUCTION

84 spills (Figure 5) have been documented along the TMPL and TMX systems. Pipeline spills are difficult to remediate due to the chemical composition that is present within the properties of crude bitumen and its diluents (King et al., 2020). When a spill occurs in a water body, condensate: a “volatile liquid by-product of natural gas extraction from field separators, scrubbers, or inlets of natural gas processing plants”, begins to evaporate; this leads to the diluted bitumen “increasing rapidly” (King et al., 2020). Only 10-15% of spilled oil can be recaptured: recovery limitations require that oil must be recovered (1) before the oil spreads thin (less than 2mm thin), (2) before the oil extends towards the shoreline, (3) before the oil is immersed “into the water column”, and (4) before the spatial area extends beyond operative scope (City of Vancouver, 2015; King et al., 2020). Due to the volatile, noxious, and chemical properties of spilled oil, recovery and remediation of any significant portion of a spill is a consequential challenge.

In regards to community impacts, Jonasson et al. (2019) states that a TMX spill has the potential to expose Indigenous communities to chemicals that pose notable risks, such as benzene, benzo[a]pyrene, and polycyclic aromatic hydrocarbons (p.505). These chemicals can affect the reproductive, immunological, and neurological development of fetuses and individuals (Jonasson et al, 2019). Further concerns arise as Indigenous communities are at particular risk of experiencing disproportionate effects from pipeline spills. Hurlbert and Datta (2022) find that greater than 50% of Indigenous communities on reserve are at “high risk of pipeline spills”(p.1).

The spills charted here (Figure 5) are documented by the corporation Trans Mountain itself in their Spill History (Trans Mountain, 2019). It should be noted that not all releases are included in these reports, only those above a certain threshold. The required definitions for their reporting have also changed and thus further muddy the waters regarding what is and is not reported. As of 1999, Trans Mountain reports any release of low vapour pressure hydrocarbons greater than 1.5m³ or 1500 litres. Self reporting goes back as far as 1961

HISTORY OF SPILLS ALONG TMPL & TMX

The following is a breakdown of 5 notable spills which have occurred along the TMPL and TMX systems. Together they illustrate Trans Mountain’s history of spills, a history of significant environmental and social impact caused by corporate negligence and by deception and inadequate distribution of information.

SPILL 1: JASPER NATIONAL PARK SPILL, 1966

The TMPL and TMX run directly through protected ecosystems and pose existential threats to their environments. In 1966, the Trans Mountain Pipeline had its second largest recorded spill directly adjacent to Jasper National Park, where **1.1 million litres of crude oil** were released from a 2 metre rupture (Kheraj, 2015). More than 130 thousand additional litres have been released in **5**

additional spills, within or adjacent to Jasper National Park since Trans Mountain's development, not including an additional two spills of unknown volume (Rieger, 2017; Trans Mountain, 2019). Jasper is not the only protected area adjacent to the pipeline, there are countless watersheds downstream of the pipeline route. (See: Habitat Loss; Species At Risk for a breakdown of the pipeline's impact on endangered species).

Image 4.

Trans Mountain Pipeline running through Jasper National Park



NOTE: Image 4). Spill 2: Pipeline in Jasper National Park. The Glenbow Museum - Archives Photographs, 1952-1953

SPILL 2: EDMONTON TERMINAL SPILL, 1985

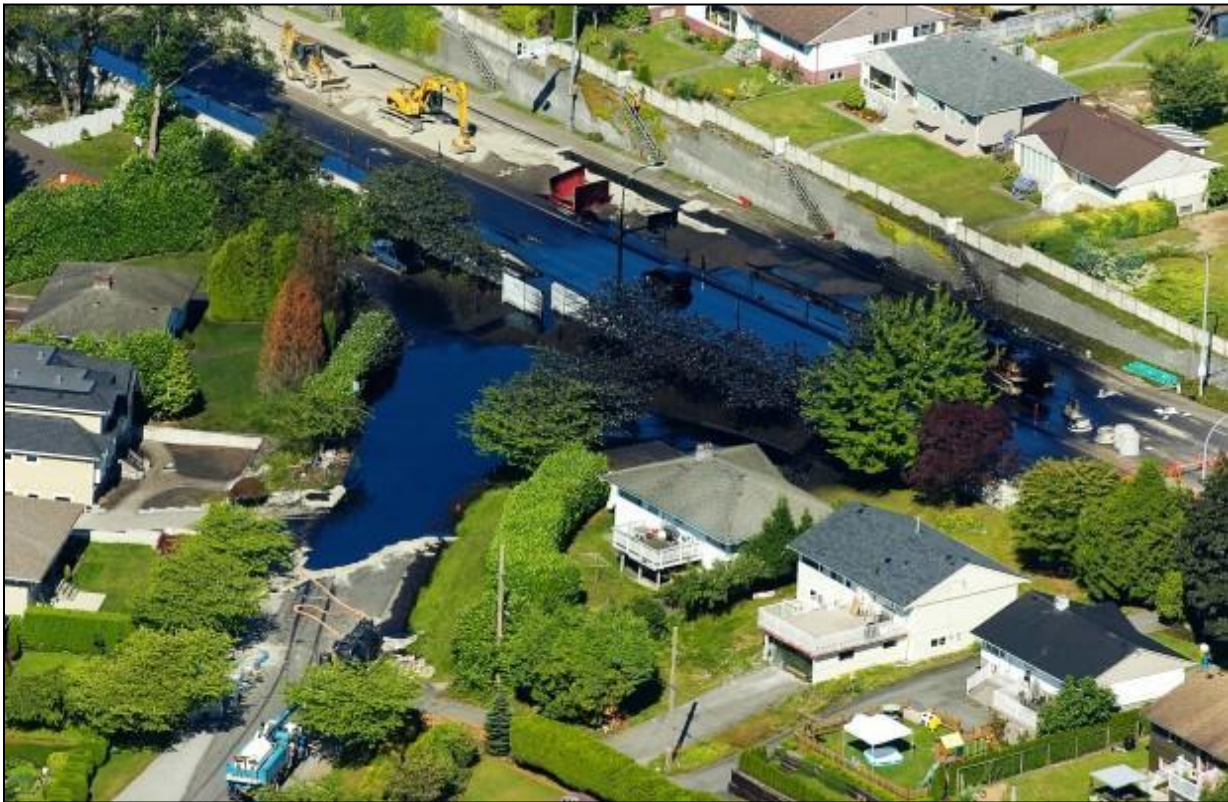
Trans Mountain's largest spill occurred on January 14th, 1985 at the Edmonton Terminal, when the floor of an oil tank gave way and released **1.6 million litres of crude oil**, more than half of an olympic swimming pool, into the surrounding areas (Kheraj, 2015). Of the 84 documented spills along TMPL and TMX since 1961: 25 have occurred at the Edmonton TMP Terminal alone (Trans Mountain, 2017b, Trans Mountain 2019).

SPILL 3: WESTRIDGE DOCK TRANSFER LINE SPILL, 2007

On July 24th, 2007, a backhoe operator in Burnaby punctured an underground part of the pipe to the Westridge Terminal. 1500 barrels of crude oil were violently released onto a Burnaby street (Image 5) and residential area, later draining into the Burrard Inlet. The backhoe struck the pipe because of an inaccuracy in 1950s documentation regarding the location of the pipe (CBC News, 2007; Kheraj, 2015). This spill occurred directly within an urban setting significantly altering the daily life of families living near the pipeline. Improper management of the pipeline and its records led to harm to local communities.

Image 5.

Oil pipe burst on Westridge Dock Line in Burnaby



NOTE: Image 5). Spill:3 Westridge Dock Transfer Line Spill, 2007. Oil covering a Burnaby neighbourhood. Sacred Trust Initiative, n.d.

SPILL 4: DARFIELD PUMP STATION SPILL, 2018

The Trans Mountain Pipeline continues to spill, and whenever possible the cooperation and government silence coverage and twists the narrative. On May 27th, 2018 a spill was detected along the TMPL near the Darfield Pump station. The B.C. Environment ministry initially reported that around 100 litres of Crude Oil were released. At a later date, it updated this number to nearly 5000 litres. The Canadian Government bought the TMX project from Kinder Morgan only 2 days after this spill

occurred (CBC News, 2018). Knowing how much oil, what kind of oil, and the precise location of oil spilled is vital information for communities trying to adapt and react to the impacts of a spill on their soil. At the moment, this information is very difficult to find, making critical data inaccessible.

Image 6.

Sumas Station Oil Spill Site near Abbotsford



NOTE: Image 6). Spill 5: Sumas Station Spill, 2020. McCartney, Peter, 2020.

SPILL 5: SUMAS STATION SPILL, 2020

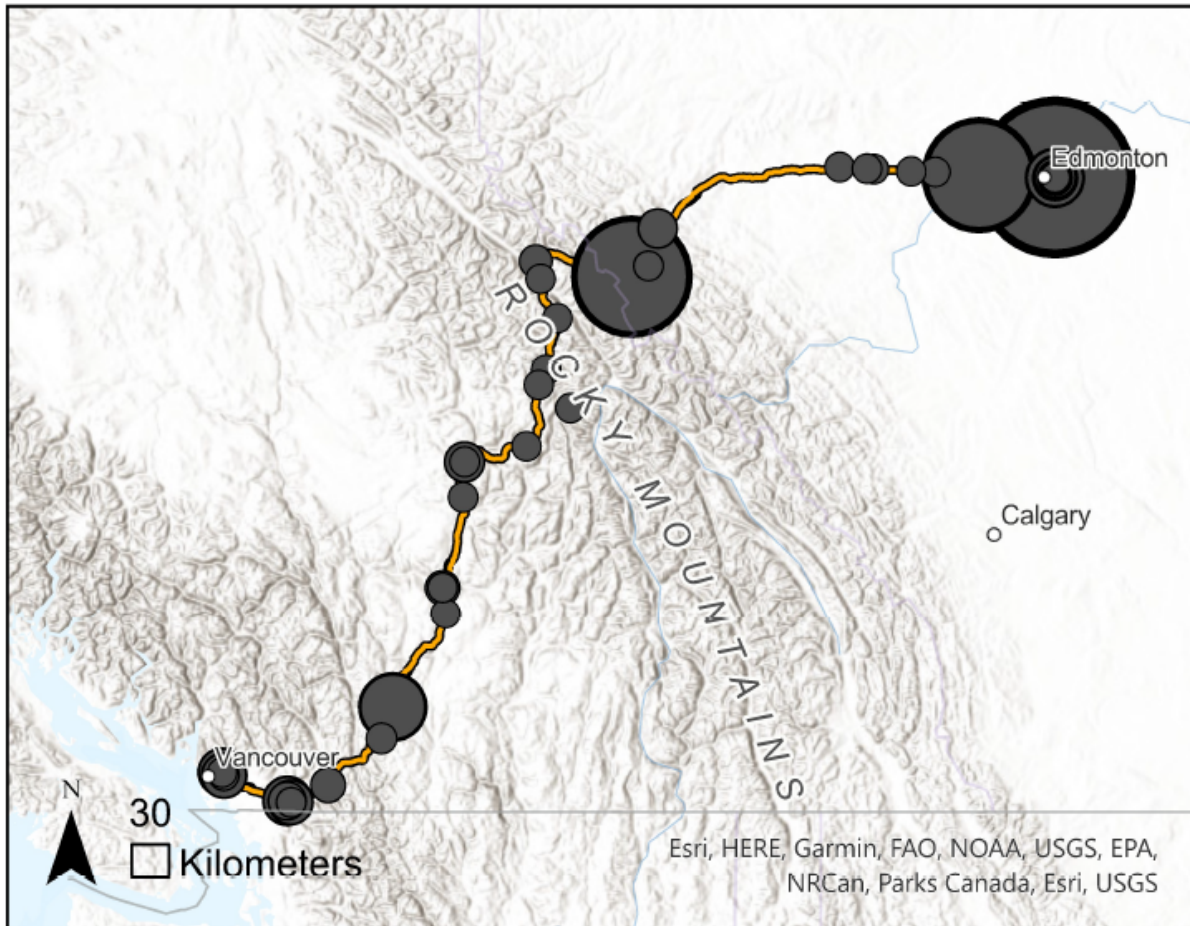
These oil spills continue to burden and poison local communities and environments. Most recently, on June 13th, 2020 an oil spill was detected by Trans Mountain at the Sumas Pump Station in Abbotsford, BC. The spill released around 190,000 litres of Crude Oil near an aquifer that supports local communities including the Sumas First Nation, who stand opposed to the expansion. Since 2000, almost 550,000 litres of Crude Oil have been spilled near the Sumas Station (Cardinal, 2020).

“Our main concern is for the clean-up of this spill and preventing further impacts to our territory. We need to have our monitors on the ground immediately. We need to understand what is going on from our point of view, how much oil spilled, what has been impacted, and what needs to be done to clean it up. We cannot continue to have our land desecrated by oil spills. This is the fourth

time in 15 years that this pipeline has had a spill on our land. The proposed Trans Mountain expansion route would see an additional pipeline crossing one of our sacred sites...” - Chief Dalton Silver, Sumas First Nation (UBCIC, 2020).

Figure 5.

Map displaying reported oil spills along the TMPL and TMX route



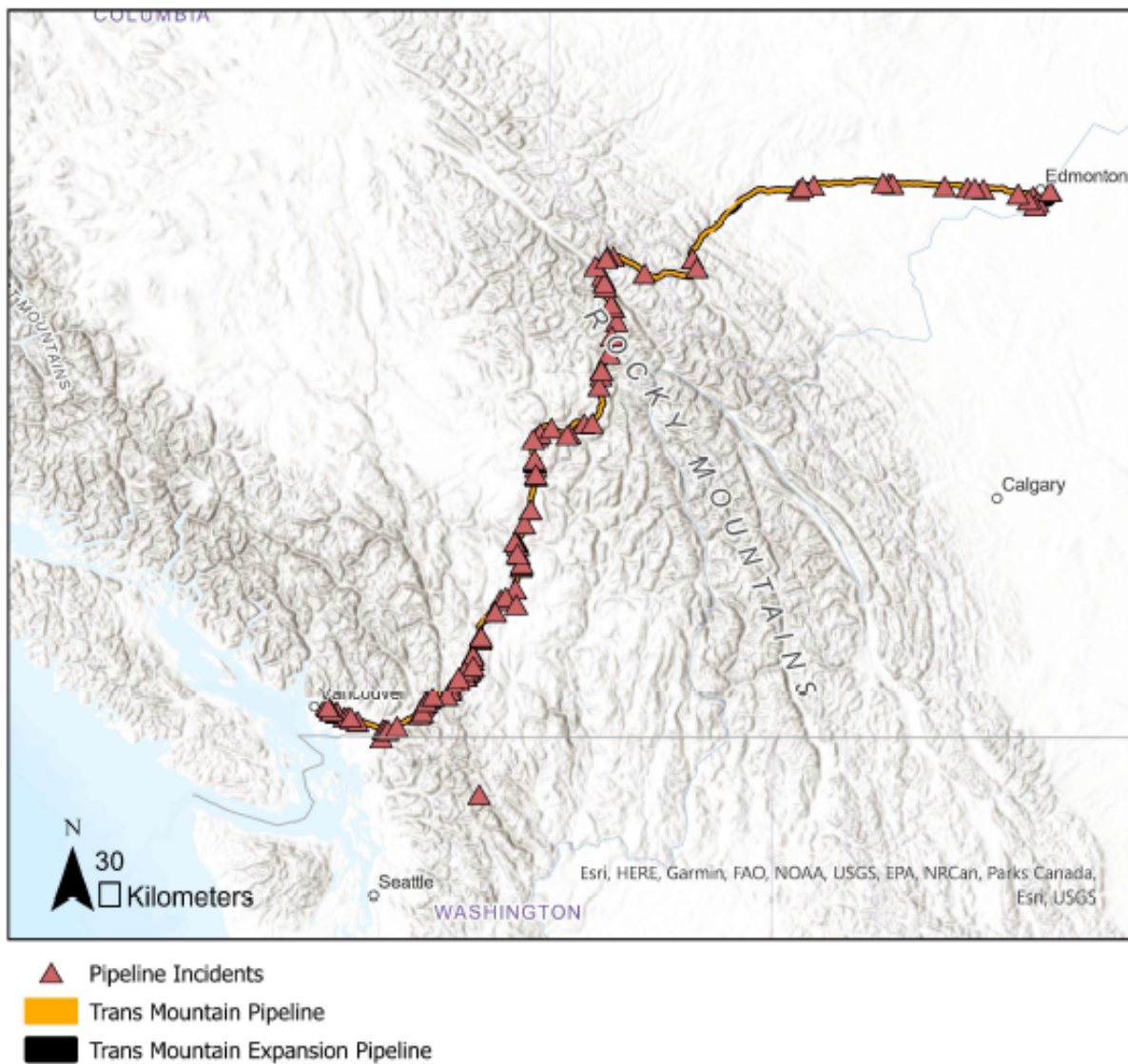
NOTE: Figure 5). Map displays all recorded spills along the pipeline since 1961, spill locations are denoted with black circles scaled based on spill size.

“Over one million residents around Burrard Inlet (including Tsleil-Waututh Reserve) are at risk of acute health effects from toxic air emissions from a worst-case oil spill
(Nation, T.W., 2015)

INCIDENTS AND IMPACTS

Figure 6.

Map displaying reported incidents along the TMPL and TMX route



NOTE: Figure 6). Map displays all recorded incidents along the pipeline, incident locations are denoted with red triangles. Data is from the Trans Mountain ULC.

Over the course of the TMPL and TMX project, numerous incidents have occurred. Since 2008, at least 171 incidents have been reported by Trans Mountain. The reported incidents include 71 fires, 37 serious injuries, 30 operations beyond design limits, 17 adverse environmental effects, 14 releases of substances, 2 explosions, and 1 fatality (Canada Energy Regulator, 2023).

Beyond spills and fires, these incidents have detrimental effects on flora and fauna, wildlife, and local communities. The threat of fire has become critical to such an extent where the City of Burnaby has chosen to construct a new fire station immediately beside the Trans Mountain tank farm.

The need for the new fire hall in close proximity may be due in part to a study which revealed that a fire caused in the tank farm could “create a chain of events that would lead to flames engulfing Burnaby Mountain and massive evacuations of the surrounding neighbourhoods” (Hager, 2015). In addition, a surprise inspection done by the Canada Energy Regulator (CER) established that without an immediate response within the first ten minutes of a tank farm fire, residents would be exposed to toxins and fire for up to the two hours it would take to reach the site from the then closest fire station (Naylor, 2021).

Additionally, a critical workplace fatality transpired in 2020; however, it was deemed a “non-emergency” by Trans Mountain . Trans Mountain is directly responsible for the death of the employee due to the company’s failure to (1) ensure safety of the worker, (2) implement processes for identifying hazards, (3) ensure workers were fully trained, and (4) to ensure supervision for safe duties. Trans Mountain was fined \$164 000 for the incident (Government of Canada, 2022). Compared to the current TMX project cost of \$30.9 billion, the CER fine of \$164,000 appears inconsequential for the company (CBC News, 2023).

In terms of violations, Trans Mountain has been subject to issues of non-compliance including sediment laden water going into a water body, over-withdrawing water, having exceptional levels of hexavalent chromium levels in water, and more (Trans Mountain, 2023).

HABITAT LOSS

The TMPL and TMX project have significant effects on habitat within B.C. and AB. Recent studies and assessments have supported this claim. The TMX project intersects nine designated rare ecological communities, 18 wetlands, and one migratory bird nesting zone (Trans Mountain, 2021). Furthermore, the TMX crosses 146 watercourses, of which 84 have been identified as fish-bearing with 16 critical species (Trans Mountain, 2021).

TMPL and TMX construction activities include the tree and vegetation clearing of large swaths of area along the pipeline route . Two documented cases are highlighted below.

SPOTTED OWL HABITAT: COQUIHALLA RIVER VALLEY

The TMPL and TMX pipeline route intersects directly with a known spotted owl habitat along the Coquihalla River Valley. The Spotted Owl is an endangered species, with only three owls known to exist in the wild. In 2023, the Government of British Columbia approved 24 cutblocks, authorised areas where licence holders may harvest timber, through Spotted Owl core critical habitats in order to further construction activities (Wilderness Committee, 2023). Deforestation has been the leading cause of the endangerment of this species, and the continued removal of their nesting trees can only be seen to put further stress on this already endangered species. (See: Northern Spotted Owl).

ANNA'S HUMMINGBIRD AND MIGRATORY BIRD NESTING HABITAT: BRUNETTE RIVER

In April of 2021, Trans Mountain engaged in tree cutting and vegetation clearing in an area along the Brunette River near Burnaby during the nesting season of many migratory birds. One of the trees cut down was the nest of an Anna's Hummingbird, it destroyed both the nest and an egg (*Trans Mountain Pipeline ULC et al v. Canada (Environment and Climate Change)*, 2021). Anna's Hummingbirds are protected under the Migratory Bird Convention Act, which prohibits the harm of such migratory birds, including their nests and eggs. As a result, Trans Mountain was ordered to halt construction in the section of forest in Brunette River until August 20th of 2021. Trans Mountain was also issued a fine of \$88,000 that was later reduced to just \$4,000 for the destruction of the bird nest. As part of their environmental mitigation plans, Trans Mountain has measures in place to prevent the destruction of nests during the nesting seasons of migratory birds, including non-intrusive monitoring and the creation of buffer zones around active nesting sites (Trans Mountain, 2021). These were clearly ignored in April of 2021, resulting in the harm of Anna's Hummingbird (Image 7).

Image 7.

Clear cutting in Brunette River as part of TMX construction activities



NOTE: Image 7) Protect the Planet, 2021

SPECIES AT RISK

TMPL and TMX intersect with the habitats of a variety of endangered species and species at risk. Below, the impacts and dangers to five of such species are highlighted.

CHINOOK SALMON

In 2016, seven Fraser River chinook populations were classified as 'red' under Canada's Wild Salmon Policy, which is one third of all Fraser River chinook populations. Chinook begin their lives in the freshwater Fraser River and its tributaries, and as fry and juveniles, they spend a significant amount of time in these watercourses as they develop. In this vulnerable state of development, chinook are highly vulnerable to oil spills. The TMX pipeline intersects with many known chinook salmon-bearing watercourses along its route. In total, there are 32 chinook-bearing watercourses that are within the pipeline route, and 40 distinct points at which the pipeline crosses chinook-bearing watercourses (Trans Mountain, 2013). As juveniles on their journey to the Pacific ocean, ocean-type chinook migrate through the estuaries of the Fraser River, which are frequented by oil tankers. In the case of an oil spill from either an oil tanker or pipeline, chinook are highly vulnerable to being exposed to oil, and may face various dangerous physiological effects.

The Raincoast Conservation Foundation found many deficiencies in Trans Mountain's assessment on the potential impacts an oil spill in the Fraser River could have on chinook and other salmon species and are detailed below (Logan et. al., 2018):

- Models of spilled oil did not take into account the effect of debris and other obstructions that could be in watercourses. These increase the amount of oil that ends up accumulating along shorelines. When disturbed, the toxic organic compounds found within the oil can be more easily leached into the water for exposure to salmon species, or mixed with sediments and contaminate waterbeds, where salmon embryos are found.
- Oil that sinks or is suspended in the water columns are not a part of Trans Mountain's spill mitigation plans. Sunken and/or suspended is how chinook are primarily exposed to the toxins within oil.
- Trans Mountain did not base their modelling of the fate of oil in the event of a spill based on the minimum concentration that effects on fish have been documented. Instead, their model used a value that was three times greater.

Given the vulnerability of the chinook population, their likelihood of exposure to toxic organic compounds in the case of an oil spill, and Trans Mountain's incomplete modelling and preparation for an oil spill event, it should be a priority for the protection of the over 30 watercourses that chinook spawn and develop from contamination.

KILLER WHALES: IMPACTS AND EFFECTS

As previously stated, to support and ship the influx of oil delivered to the lower mainland and to other global markets, Trans Mountain is building a new marine terminal, the westridge marine terminal, on the lower mainland in the Burrard Inlet. Operation of this marine terminal is slated to increase traffic in the Burrard inlet primarily in the form of Aframax (245m) size tankers (Trans Mountain, 2017c). After the expansion around 408 tankers will access the Westridge Marine Terminal yearly, an increase of nearly 350 tankers (Nikiforuk, 2018). The Burrard Inlet is accessed through marine shipping routes leading south towards the Strait of Juan de Fuca.

It's important to note that Critical Habitat for SRKWs (*Orcinus orca*) (Figure 7) surround the southwest coast of Vancouver Island, and into the interior of the Salish Sea including the Puget Sound and parts of the Strait of Georgia (Government of Canada, 2018). SRKWs are an endangered species in Canada and the US, with only around 75 individuals remaining (US EPA, 2013).

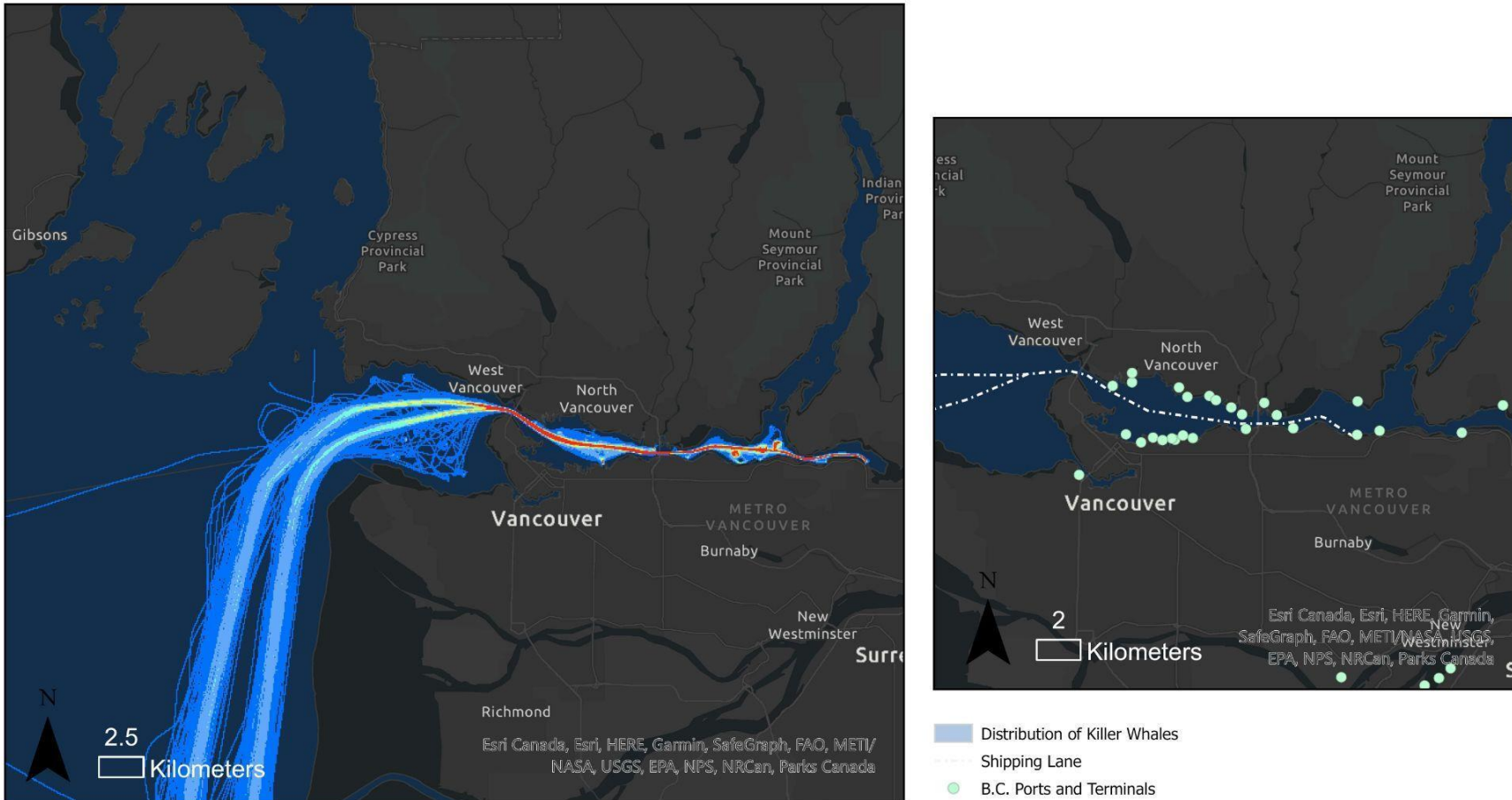
Ocean going vessels make significant amounts of underwater noises, typically correlated with their size and speed. This poses an issue for marine species, especially marine mammals. SRKWs in particular are threatened because of their precise use of echolocation for hunting and auditory communication for social behaviours (Ford, 1989; Simon et al., 2007). Killer whales forage for primarily Chinook Salmon, with echolocation accurate to more than 100 m away, ambient noise diminishes their hunting capabilities by crippling their echolocation (Au et al., 2004; Ford et al., 2017). Ship traffic (Figure 7), underwater construction, and pollution are the biggest threats to Orca population, all of which are threats imposed by TMX and the Westridge Marine Terminal (Figure 7) (Ford et al., 2017), given this, the noise from the increased traffic is proven to be a crucial concern.

Studies show that the noise generated by Neo-panamax size tankers, a model smaller than the Aframax tankers associated with the Westridge Terminal, consistently have significant negative effects on SRKW populations at 1 km away from the tanker. Even from smaller ships at particularly loud times such as docking, an impact was had at over 4 km away (MacGillivray et al., 2019). These measurements create a ring of up to 8 km in diameter around a ship in which social and hunting behaviour of SRKW are detrimentally affected, this is through critically sensitive habitat, of which the Strait of Juan de Fuca can be as narrow as 18 km (The Editors of Encyclopaedia Britannica, 2010). The increased tanker traffic near Vancouver, sends directly through the summer foraging ground of the SRKW. Currently boat traffic leads to a loss of >20% of killer whale foraging time during the summer, 2/3rds of which is directly attributed to the current level of tanker traffic (Tollit et al., 2017). The increase in tanker traffic due to the development of the Westridge Marine Terminal of the TMX pipeline will inevitably cause further damage to the endangered SRKW populations already struggling in these waters.

TANKER TRAFFIC, SHIPPING LANES, AND PORTS

Figure 7.

Killer Whale Maps. Left: AIS Data of tanker counts layered above killer whale habitat. Right: Trans Mountain shipping lane along with the ports and terminals of B.C. layered above killer whale habitat.



NOTE: Figure 7) As previously stated, recent findings suggest that an increase in tanker traffic affects the foraging and social behaviours of killer whales, thus making an 580% increase in tanker traffic from just Trans Mountain (408 tankers increase from 60) in the habitat of killer whales distressing. Furthermore, the Trans Mountain Pipeline shipping route and terminal expansions directly intersect endangered habitat of killer whales (right). In addition to acoustic disturbances, a large concern arises regarding Panamax and Aframax tanker spills, killer whale tanker strikes, and oceanic pollution (Department of Fisheries and Oceans, 2018).

NORTHERN SPOTTED OWL

The TMX project's immediate proximity and intersection in northern spotted owl habitat (Figure 8) is reason for concern. Currently, northern spotted owls are only found in old-growth forests within the Pacific Northwest. The Northern British Columbian range once fostered over 1,000 northern spotted owls; however, they are now witnessing visible decline as the species' range continues to experience significant threats such as deforestation (primary threat), logging, land development, and other anthropogenic events, which are leading to habitat fragmentation (Ministry of Environment, Lands and Parks, 1998; Government of B.C., n.d.). Studies show that there are "strong association[s] of nest and roost sites with older forest conditions and a wider range of forest cover types used for foraging and dispersal" (Lesmeister et al., 2018). Thus, the deforestation of old growth forests and forest cover severely disturb the range and population of northern spotted owls.

Due to these factors, this non-migratory species is now listed as "endangered" in Canada (Wilderness Committee, n.d.). As such, they are the rarest owl species in the country (National Wildlife Federation). Inhabiting only old-growth forests, the northern spotted owl cannot easily relocate to newly planted forests (National Wildlife Foundation). As a result, there is no time-conscious way to restore their habitats. Currently, there are 4 wild northern spotted owls in BC with 30 more in breeding programs (Government of B.C., n.d.).

Figure 8.

Map Displaying the Critical Habitat for the Northern Spotted Owl along the TMX



- Trans Mountain Expansion Pipeline
- Chilliwack Forest District - Long Term Owl Habitat Area - Strong Protection
- Chilliwack Forest District - Managed Forest Habitat Area - Weak Protection
- Squamish/Sea to Sky Forest District - Managed Forest Habitat Area - Weak Protection

NOTE: Figure 8) The habitat of the northern spotted owl along the route of the TMX route. This map demonstrates that the habitat area is being intersected, moreover, the proximity of the pipeline is relatively immediate with other habitat zones.

The TMX project cuts through part of the owl's habitat (Figure 8) and operates very close to many other large sections. With only a few individuals remaining in B.C., it is critical to preserve as much old-growth forest as possible.

NOOKSACK DACE

Classified as endangered under Canada's Species at Risk Act, the nooksack dace is currently restricted to 3 small streams within the Nooksack River system as well as the Brunette River in Burnaby (Government of Canada, 2019). British Columbia's Ministry of Environment, Lands and Parks (1995) revealed that the habitat of the nooksack dace is critically affected by land development and human activities. The activities of the TMX project's development and activities have additionally heavily impacted this species through water pollution and other forms of habitat disruption (South Coast Conservation Program, n.d.).

The TMX and TMPL projects have a poor record for not contaminating local water sites. Examples of water contamination in the Trans Mountain February 2023 Monthly Construction Progress Update include, but are not limited to:

- A spill occurring on February 9, 2023 at the Westridge Marine Terminal (Loc.4.17.ENV.020923.00178463) where "grease used to lubricate steel winch cables was observed in the water" (Trans Mountain, 2023)
- On February 13, 2023, elevated concentrations of iron released into the ocean body at Westridge Marine Terminal were found. The sample "exceeded water quality guidelines (Loc.4.17.ENV.021323.00178748) (Trans Mountain, 2023)
- Sediment laden was found entering a body of water on February 15, 2023 (Loc.4.14.ENV.012423.00179079) (Trans Mountain, 2023)

The examples above illustrate the polluting activities of the TMX project. As multiple species, such as the nooksack dace, are susceptible to water pollution and human activities, it is critical to ensure the limitation, prevention, and termination of activities that lead to pollution.

WESTERN SCREECH-OWL

Two subspecies of the western screech owl have been assessed as a threatened species by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Government of Canada, 2019). The main threat to this species is habitat loss. In particular, the TMX pipeline route is proposed to go through a wetland near Bridal Veil Falls. The wetland is characterised by cavities within the grasses that are highly apt for western screeching-owl burrows (Pipe Up Network, 2022). Considering that the largest threat against this species is habitat loss, efforts should be made to protect suitable homes for the owl, not engage in further disruption.

COMMUNITY

The Burnaby Mountain area, like the rest of Canada, has been a place of significance for Indigenous peoples for countless generations. Today, the mountain is also home to numerous Canadians who have felt the impact of the TMX project. Primarily led by the Tsleil-Waututh nation, the Burnaby Mountain has organised a counter-movement in response to TMX's impact on the mountain. Consisting of numerous not-for-profit organisations, anti-TMX activists organise out of Kwekwecnewtxw (Coast Salish Watch House). The Watch House, constructed from the materials of a single tree, is situated near Trans Mountain's worksites on Burnaby Mountain. Kwekwecnewtxw, primarily operated by Elder Jim Leyden of the Mountain Protectors, observes Trans Mountain's activities closely and takes note of any legal violations that occur as a result of pipeline development.

Image 8.

Kwekwecnewtxw (Coast Salish Watch House).



NOTE: Image 8) Leyden, Jim, 2023

EVENTS

In addition to surveilling Trans Mountain, the Burnaby Mountain community organises to host events demonstrating a close connection to Burnaby Mountain. We attended the Burnaby Mountain Festive Hug in December 2022. At the event, community members including local residents, activists, and Indigenous representatives from across British Columbia gathered together to celebrate art, music, and culture while simultaneously voicing criticisms of TMX. The event consisted of a rally-style series of speeches followed by Indigenous ceremonies, including a drum circle and water ceremony. At the rally, not-for-profit organisations managed booths where visitors could learn about their work

on protesting the pipeline and other environmental issues. Another prominent aspect of the event was the presence of community-made artwork throughout.

Community artwork (Image 9-11) often combined cultural iconography with current issues. Throughout this project, we had the opportunity to work with one of these artists: George Rammell. Rammell is an artist who previously taught at Capilano University as well as Emily Carr University, and worked under the renowned Haida artist Bill Reid. Despite having limited experience creating political art, Rammell pivoted to create TMX-specific pieces five years ago. Since then, a number of his pieces have made regular appearances at TMX rallies. The images below highlight a few of his most recent works. In addition to producing artwork, Rammell has hosted meaningful community events to unveil his latest works. His latest piece, revealed in March 2023, is a large sculpture of three caricatured B.C. Judges (Image 13). He revealed the piece through an interactive performance at the Longhouse Council of Native Ministry, an Indigenous Church in Burnaby. At the event, Rammell also hosted a panel of speakers to discuss the legal and moral implications of the justice system's bias against anti-pipeline activists (McKenna, 2023).

Image 9-11.

Photographs taken during the Burnaby Mountain Festive Hug 2022



NOTE: Image 9 (left). Anti Pipeline Poster on tree. Yao, Bruce, 2022., Image 10 (middle). Tsleil-Waututh Member Reuben George speaking in front of event participants. Yao, Bruce, 2022. Image 11 (right). George Rammell beside his wooden sculpture

Rammell's work is one of many forms of resistance. Since the Government of Canada's acquisition of the TMX project, local communities have banded together to protest the pipeline. Regardless of the method of protest, there is a clear message behind the anti-TMX movement: the people have not consented to this project.

Image 12 & 13.

George Rammell's artwork depicting a caricatured Justin Trudeau on a see-saw, George Rammell next to his latest piece



Note: Figure 12) Yao, Bruce (2022). Figure 13) McKenna, Cara (2023)

IMPLICATIONS

This report outlined the social and environmental consequences of the TMX project. Due primarily to its large scale, the TMX project has required deforestation, heavy construction, and the use of large areas of land. As a result, the documented instances of oil spills, Indigenous consent issues, and habitat destruction are not surprising. This section briefly outlines the broader implications of the TMX project in respect to important national issues.

HUMAN RIGHTS

The TMX project, passing through Indigenous territories in Alberta and B.C., does not have consent from everyone impacted by the pipeline. The protests on Burnaby Mountain, led by the Tsleil-Waututh First Nation, are examples that not everyone has consented to the project. This is particularly relevant in respect to Canada's commitment to both human rights and reconciliation.

On June 21, 2021, Canada passed the United Nations Declaration on the Rights of Indigenous Peoples Act into federal law. This act stipulates that Canada must: "take all measures necessary to ensure the laws of Canada are consistent with the United Nations Declaration on the Rights of Indigenous Peoples (the Declaration)" (Government of Canada n.d.). This is part of Canada's commitment to reconciliation, and plays an important role in advancing human rights in Canada. However, the TMX project has, in some sections, foregone the appropriate processes of obtaining consent from the Indigenous owners of the land. This contradicts Canada's commitment to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). The following clauses, concerning Indigenous land rights, are especially relevant:

"Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquire (UNDRIP, Article 26) (United Nations, 2007)

"States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned. (UNDRIP, Article 29) (United Nations, 2007)

"Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination. (UNDRIP, Article 29) (United Nations, 2007)

“States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilisation or exploitation of mineral, water or other resources. (UNDRIP, Article 32) (United Nations, 2007)

“States shall provide effective mechanisms for just and fair redress for any such activities, and 24 appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact. (UNDRIP, Article 32) (United Nations, 2007)

Throughout this project, we have discussed the following issues:

- 84 TMX and TMPL oil spills, which disproportionately impact Indigenous livelihoods
- Indigenous peoples such as the Tsleil-Waututh First Nation argue that the TMX project uses Indigenous land without consent
- Habitat loss occurring across the TMX route, harming species that play significant roles in Indigenous culture

As such, the TMX project contradicts Canada's commitment to reconciliation and violates several principles of UNDRIP. The inability to guarantee Indigenous rights, combined with the arrest and imprisonment of numerous community members, severely undermines Canada's credibility when it comes to advancing Indigenous rights on both domestic and international stages. The TMX project is not just an environmental concern; it is a human rights issue.

ENVIRONMENT

In addition to human rights concerns, the TMX project, like all pipelines, has significant environmental implications. In 2020, the oil and gas sector accounted for 27% of national greenhouse gas emissions and has increased emissions by 74% since 1990 (Statistics Canada, 2023). The federal government provides at least \$4.8 billion a year in fossil fuel subsidies, with provincial subsidies ranging from an additional \$350 million to \$1.16 billion per year (Corkal & Gass, 2020). With the addition of other public finance flows to fossil fuel projects, Canada's total contributions towards fossil fuel developments average \$11 billion a year (Corkal & Gass, 2020). Though each pipeline has differing circumstances and environmental impacts, they all require a significant amount of land and labour to construct and increase fossil fuel extraction. The following section details the specific impacts of the TMX project.

- Dramatically increased output from the TMPL system from 300,000 barrels a day to 890,000 barrels a day

- 84 oil spills across the TMPL and TMX systems, which release chemicals into surrounding ecosystems. These spills are nearly impossible to clean up effectively.
- 71 fires, 37 serious injuries, 16 adverse environmental effects, 13 releases of substance, 2 explosions, and 1 fatality.
- Reported instances of releasing sediment-laden water into nearby watersheds, overusing water, and having abnormal levels of hexavalent chromium levels in the water.
- Increased tanker traffic in the Strait of Georgia and Burrard Inlet. Increased maritime traffic has been observed to have the following results on both Southern and Northern Killer Whale species: sensory disturbance, increased risk of injury, and increased mortality rate.
- Contributed to the reduction of habitat zones for 52 species identified on the BC CDC's Species at Risk database and Environment and Climate Change Canada's Critical Habitat for Species at Risk database.

A signatory of the Paris Agreement (2016), an international treaty on climate change, Canada has committed to reducing greenhouse gas emissions by 40-45% below 2005 levels by 2030 (Statistics Canada, 2023). As of 2020, Canada's emissions are down 9.3% from 2005 levels. In other words, there are 7 years left to achieve at least a 30% reduction in national emissions. Projects like the TMX pipeline hinder this progress and reduce the credibility of Canada's climate commitments. However, it is not just Canada's national image under threat. Communities and ecosystems along the TMX pipeline are being threatened.

CONCLUSION

LIMITATIONS AND FURTHER RESEARCH

Though the community involvement in delaying the completion of the TMX project is critically important, we were unable to fully explore the community's role in influencing pipeline activities due to time constraints. During our research process, we have encountered multiple areas that continuing research cohorts and individuals should consider as areas to focus on. These areas are split into the following groups: Water and Ocean, Indigenous Human Rights, Protest and Community, and Personal Testimonies.

Water and Ocean concerns a closer dissection of the effects TMX has had on waterways and the link it has to the species at risk highlighted in this paper. This may be a continuing examination of tanker traffic and its relation to marine life habitat, the TMX leasing of ocean lots, (such as the Bureau of Ocean Management leasing agreements) or connecting to Indigenous Human Rights, where our community partners have discussed looking closer at the water quality in Indigenous Neighbourhoods as a direct result of TMX construction. This may then lead into a broader discussion of Indigenous Health along the pipeline, and health detriments as a result of exposure to diesel and bitumen brought about by the construction as well.

Protest and Community, as well as Personal Testimonies, are areas that we were unable to include due to time constraints. Owing to robust national research ethics standards, the process to submit and receive approval for an ethics proposal was beyond the scope of our project. Consequently, we were unable to conduct interviews with prominent community organisers. Nevertheless, we strongly believe that amplifying the voice of the anti-TMX community is of vital importance to any project highlighting the controversy behind the project. As such, we recommend that future iterations of the project begin the ethics proposal process early and implement community voices into the core of the project. Moreover, interviews allow for a personal and deeper understanding of the skewed judging system for cases related to TMX protesting. As a whole, these interviews would engage with an empathetic and individualised understanding of how the expansion has negatively impacted the lives of many communities.

Additionally, highlighting the often-unfair arrests and sentences of TMX activists, which has been the highlight of much of George Rammell's work, was beyond the scope of this project. Comparing the treatment of the anti-TMX community to other progressive movements in Canada may reveal additional layers of discrimination embedded in both capitalist and colonial narratives. Furthermore, while the arrests and sentences are compliant with Canadian Law, there are ethical concerns regarding its selective application by judges and law enforcement officers. In order to address this issue, a comparative analysis of TMX-related arrests is necessary.

Expanding transportation of the semi-liquid form of crude oil extracted from the Canadian oil sands in the province of Alberta, known as bitumen, will intensify adverse local impacts. These come, for example, from increased exposure to volatile chemicals known to cause respiratory problems [4], increased risk of pipeline fire [5], and greater greenhouse gas emissions with climate change-related health impacts (Jonasson et al., 2019).

The TMX project has significant impacts on local communities, environment, Indigenous peoples, and critical and endangered species. As multiple violations of UNDRIP have been observed, along with the dismissiveness of Indigenous voices, we, the UBC CJRC research team, propose the following recommendations for the TMX project.

- (1) We strongly recommend Trans Mountain to engage in increased and ongoing decision-making and public participation with Indigenous communities and local citizens in order to gain further understanding of traditional ecological knowledge and community concerns.
- (2) Trans Mountain must provide increased transparency so that members of the public can provide informed decisions, perspectives, and recommendations,
- (3) In the event of a spill or incident (which must be decreased), we require the TMX project to substantially increase remediation and treatment procedures and percentages to ensure no harmful effects on community and environment will occur.
- (4) As previously mentioned, the TMX project is leading to the expansion of facilities and terminals, which is leading to the growth of the number of tanker traffic in critical killer whale habitat. We strongly recommend Trans Mountain to regulate and decrease the number of tankers operating in the said area to prevent further disturbances to killer whales.

If these recommendations can not be accommodated to their full and equitable extent, we believe the TMX project should be halted.

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