Vopak Pacific Canada

Supplemental Technical Report:
Rail Traffic Beyond the Scope of the Project

November 9, 2020

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1 Introduction

Vopak Development Canada Inc. (Vopak) is proposing to develop the Vopak Pacific Canada Project (the Project) which will utilize the existing Canadian National Railway (CN) rail line, including a 177.3 kilometres (km) section of the line that runs from the Prince Rupert Port Authority (PRPA) lands to 19 km east of Terrace, British Columbia (BC) (**Figure 1**). SNC-Lavalin has prepared this supplemental technical report to address potential effects from the incremental increase in rail traffic along the rail line.

The proposed Project includes a new bulk liquids tank storage facility in Prince Rupert, BC, and a marine export terminal. The Project will store Liquefied Petroleum Gas (LPG) (i.e., propane), Clean Petroleum Products (CPP) (i.e., diesel and/or gasoline), and methanol on behalf of Vopak's customers. All products will be transported from various locations across Western Canada to the Project via the existing CN line. Customers of Vopak will schedule the transportation of the products to the facility and will ship the products from the Project's jetty to international markets. The Project includes the receiving and unloading of customer products from rail cars on rail tracks into the Project's rail unloading area and into Project storage facilities. From the storage facilities, the product is loaded via pipeline along the Project's jetty to a berthed ship ready to take the products to their destination.

The rail line that Vopak customers would utilize to ship product to the Project for storage is owned and operated by CN and regulated by Transport Canada. Vopak, serving as the storage facility for products that would be destined for the Project facility, has no authority over, or input into, the operation, management or mitigation of effects or any type of risks from the rail line.

1.1 Purpose

Vopak is preparing an Environmental Effects Evaluation/Environmental Assessment Certificate Application (EEE/Application) for the proposed Project subject to review under the BC *Environmental Assessment Act* and the *Canadian Environmental Assessment Act, 2012.* According to the BC Environmental Assessment Office's (EAO) Section 11 Order for the Project, rail activities that are related to the Project are defined as "the operation of rail tracks used by the proposed Project within the Port of Prince Rupert". Federal regulators confirmed in a letter dated March 1, 2019 (Smith 2019) that they will conduct a determination on the likelihood of significant adverse environmental effects based upon a review of Project components that include "rail loading and unloading activities within the administrative boundaries of the Port of Prince Rupert Port Authority".

Project Working Group members raised concerns in Working Group meetings (September 25, 2018 and January 23, 2019) regarding a potential regulatory gap in the assessment of rail activities associated with the Project, and all other projects, that do not assess potential rail effects beyond the direct control of the proponent. Members of the Working Group requested additional information on the potential effects of rail operations that are beyond the spatial boundaries and scope of the Project and outside the care and control of Vopak. As a direct response to the Working Group request, Vopak committed to a review of rail traffic beyond the scope of the project (Vopak 2019). This report is outside the scope of the EEE/Application and should not be considered part of the EEE/Application.

Vopak has prepared this supplemental technical report to be provided to Working Group members concurrent with the submission of the EEE/Application as a direct response to the Working Group request. The scope of the report has been defined based on Working Group input, key concerns raised, and available information that could be used to provide Project specific context for the concerns raised by the Working Group. Through consultation, the report was scoped to include an assessment of increased rail traffic on the following:

- **Wildlife strikes** – Effects on moose (*Alces americanus*) will be the focus due to publicly-available information and specific concerns raised by the Working Group with respect to moose strikes.
- **Traffic at rail crossings** – Wait times at key rail crossings identified by the Working Group.
- **Potential accidents and malfunctions** – Public safety and environmental issues related to potential derailments and transport of goods, including dangerous goods, through communities within the rail corridor and accidents in or near freshwater bodies.
- **Human health** – Changes in noise and air quality that could affect people along the rail corridor.

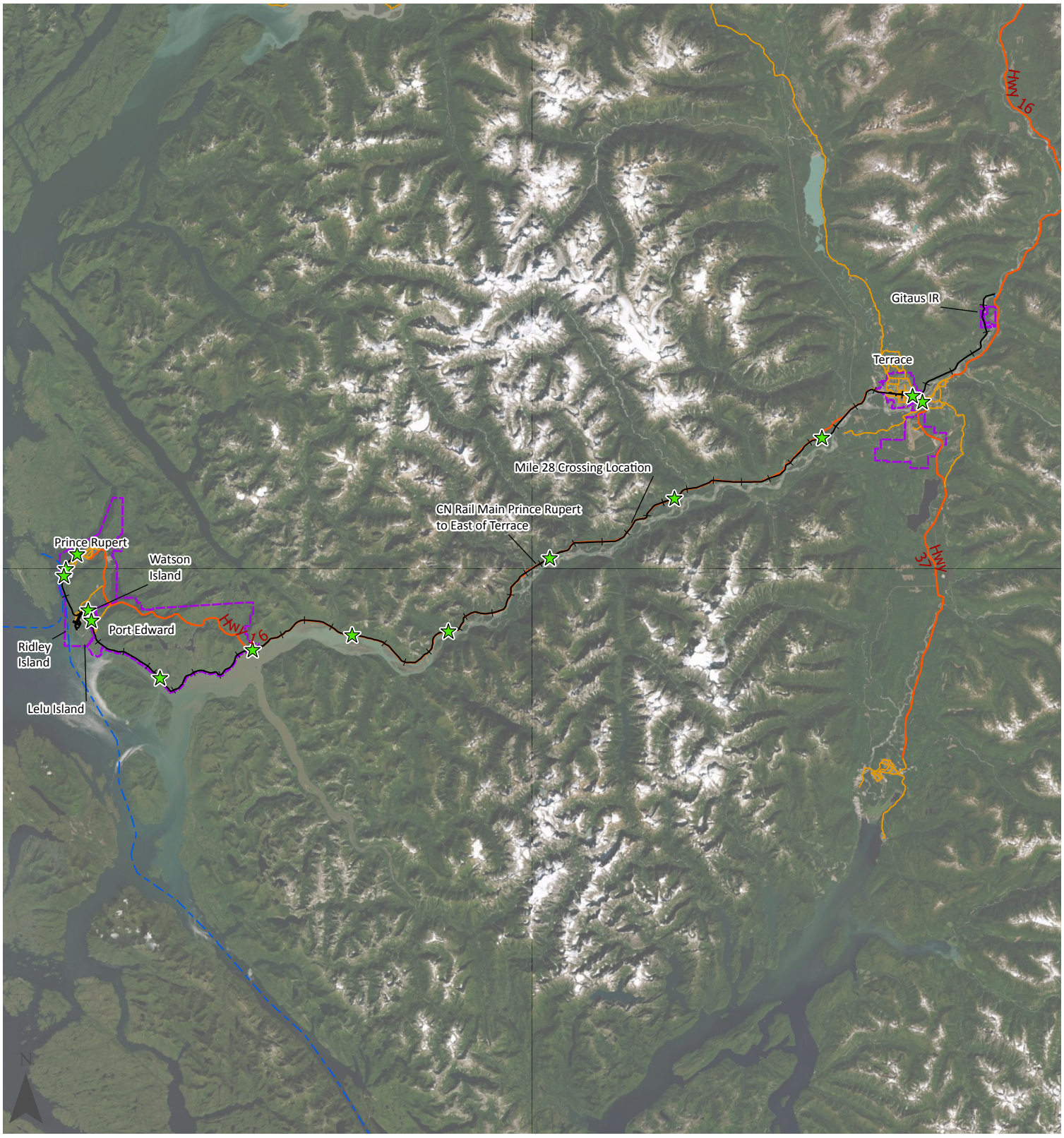
It must be recognized that Vopak has no authority over, or input into, the operation, management or mitigation of effects or any type of risks from the rail line. This report will outline the characteristics of the existing rail corridor in the region, the regulatory context, the potential effects of the Project beyond those in direct control of Vopak, as well as those outside of the immediate spatial boundary of the Project. Information was limited by the availability and quality of data related to existing and expected rail traffic as well as incident and rail crossing data that currently exists or was made available by CN or government regulators.

2 Rail Corridor Description

The section of the CN rail line network which serves the Port of Prince Rupert is known as the Skeena subdivision. The rail subdivision runs approximately 177.3 km east to west in northwest BC between Indian Reserve 1 (Gitaus IR1) of the Kitselas First Nation to Prince Rupert. The railway corridor is on relatively flat terrain at the base of the Coast Mountains and it closely follows Highway 16 west alongside the Bulkley and Skeena rivers. The railway then borders Elanor and Inverness Passage, as well as Porpoise Harbour, for approximately 17 km near or along the coastline.

The rail line passes through the following communities from east to west (**Figure 1**): IR1 Gitaus, Terrace, Port Edward, and Prince Rupert. There are nine grade rail crossings within IR1 Gitaus, two grade crossings and one overpass in Terrace, four grade crossings in Port Edward, and 16 grade crossings within the regional districts (North Coast and Kitimat-Stikine). There are 16 CN stations along the rail corridor:

- Terrace
- Kalum Pit
- Amsbury
- Shames
- Exstew
- Salvus
- Kwinitsa
- Skeena
- Tyee
- Sockeye
- Phelan
- Port Edward
- Watson Island
- Ridley
- Kaien
- Prince Rupert Terminal



Railway Station

Mile 28 Crossing Location

CN Rail Prince Rupert to 19km East of Terrace

Highways

Major Streets

Ferry/Water Routes

Communities Crossed

Project Location:
Ridley Island, Prince Rupert, BC

Client:
Vopak Development Canada Inc. (Vopak)

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Figure 1 Canadian National Railway Rail Corridor within the Skeena Rail Subdivision

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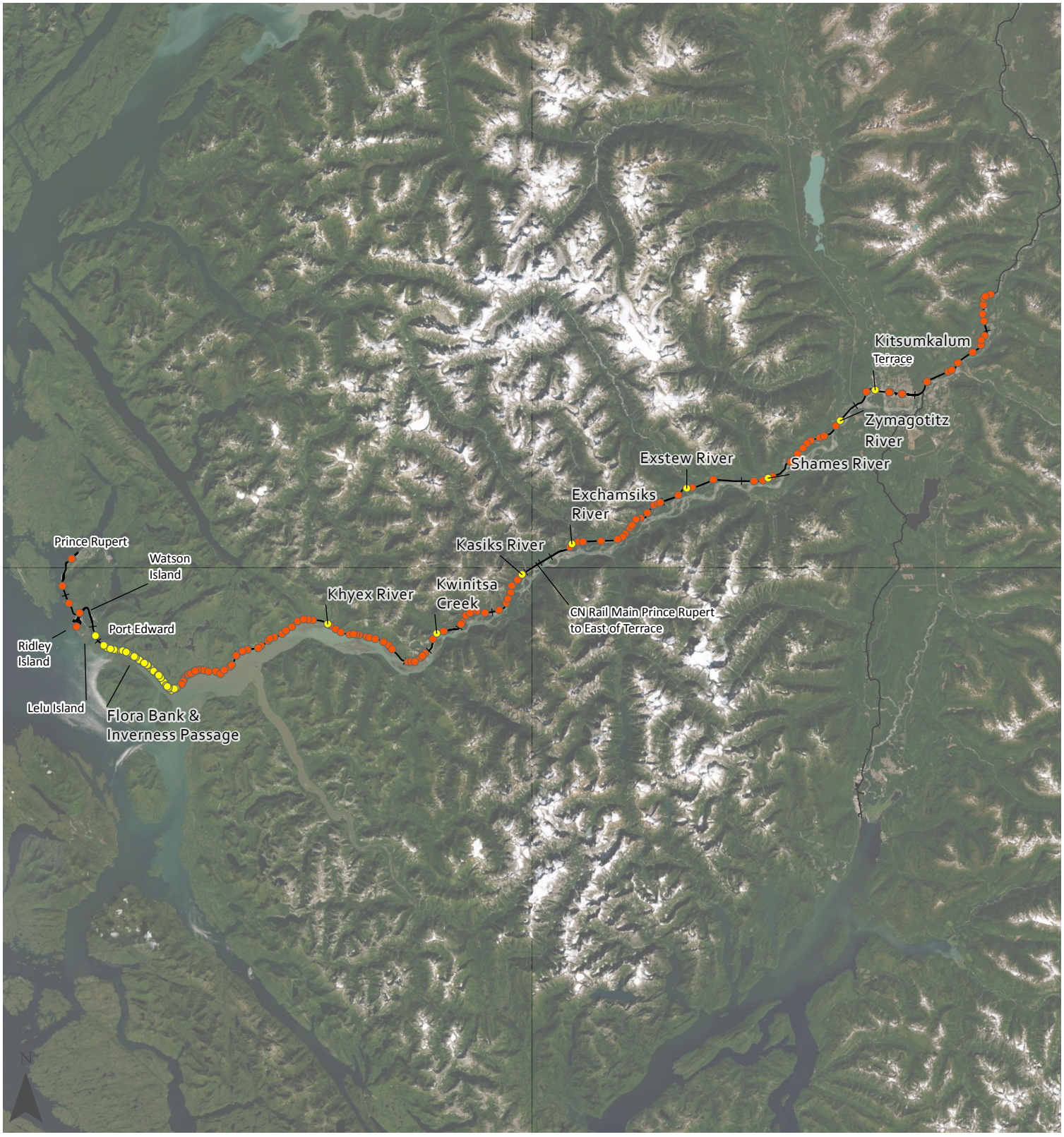
3 Environmental Sensitivities

Approximately 137 km of the 177.3 km length of rail line is within 100 m of the Skeena River or Pacific coastline. The rail line passes over a combination of over 200 major and minor freshwater crossings of intermittent and permanent streams, as well as wetlands (**Figure 2**). GIS and data derived from DataBC (2019) were used to identify the type of watercourse crossings and fish present. The watercourse crossings include the Kitsumkalum River, Zymagotitz River, Exstew River, Exchamsiks River, Kasiks River, Khyex River, Shames River, and Kwinitsa Creek. One hundred eighty (180) of the watercourses are located within 100 m of the Skeena River or the Pacific coastline and several are known to be fish-bearing, including 13 smaller tributaries flowing directly into the Skeena River. There are several other unnamed watercourses with potential fish habitat, however, they have not been assessed to determine the presence of fish.

In addition to the above, portions of the rail corridor along Inverness Passage are near Flora Bank, which is a 5 km^2 sand and eelgrass ecosystem classified as critical habitat by Fisheries and Oceans Canada (DFO) and as important habitat for waterfowl and migratory species (Canadian Environmental Assessment Agency 2016).



Main Watercourse Crossings

Watercourse Crossing

CN Rail Prince Rupert to 19km East of Terrace

National Railway Network

Project Location: **Ridley Island, Prince Rupert, BC**	SNC·LAVALIN
Client: **Vopak Development Canada Inc. (Vopak)**	

Figure 2 CN Rail Watercourse Crossings

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4 Regulatory Context

The *Railway Safety Act* is enforced by Transport Canada to facilitate railway safety and security throughout Canada. Since emergency spill response falls on the local municipality or local government jurisdiction, Transport Canada issued Protective Direction 36 under Section 32 of the *Transportation of Dangerous Goods Act*. Upon request, this legislation allows for sharing of information on the transportation of dangerous goods (e.g., flammable liquids from Class 1-9). This information includes the contact information of the municipal Emergency Planning Officials, the type and volume of dangerous goods being transported, the number of unit trains that contain dangerous goods, and the top ten dangerous goods shipped, by volume.

4.1 Safety Standards

Each municipality along the corridor has different response capabilities and CN operates under their own Emergency Response Plan. Under the *Railway Safety Act*, railway companies must inform municipalities of the products moving within their jurisdictions (e.g., number of unit trains, number of rail cars containing dangerous goods, volume of dangerous goods) (RAC 2016). If a dangerous goods rail shipment exceeds 10,000 L and is listed in the *Transportation of Dangerous Goods Regulation*, then an Emergency Response Assistance Plan (ERAP) approved by Transport Canada is required. Consequently, all rail carriers and agencies involved in the shipment require proper preparation of an Incident Action Plan. Transport Canada's safety standards involve four main steps to plan for safe transportation of dangerous goods:

1. Conduct a hazard identification and risk assessment of the dangerous goods (e.g., gasoline, diesel, and methanol).
2. Identify the appropriate response resources specific to the area.
3. Communicate with all relevant organizations (i.e., rail, ship, and responders).
4. Develop the knowledge and skills required to take action with local organizations.

4.1.1 Spills

The CN Police Communications Center (1-800-465-9239) is the primary contact for reporting spill incidents. CN Police will then contact local first responders to notify them immediately. The emergency contact for incidents involving a spill of dangerous goods is the Canadian Transport Emergency Centre (1-888-226-8832 or *666).

If a spill occurs or is at risk of occurring, a Dangerous Goods Incident Report must also be made by calling the Provincial Emergency Program (1-800-663-3456). The person responsible for the spill must be the point of contact if the quantity of the spill equals or exceeds the quantity outlined in the Spill Reporting Regulation schedule, or if a body of water may be at risk. Key information must be recorded such as:

- The owner of the substance spilled.
- The location of the spill.
- A description of the spill.
- Actions that led to the spill, etc.

If the incident poses a risk to public health and safety, then it will be assessed by CN the RCMP and local Fire Departments responsible for implementing safety protocols (e.g., evacuation).

CN's Spill Contingency Plan for BC supports an Incident Command System to manage the resources required for emergency and non-emergency spill response operations. The two primary CN groups responsible for responding to a spill are the dangerous goods team and the environmental team. The dangerous goods team oversees human health and safety, and responds to the immediate handling of the spill. This team operates 24 hours a day, seven days a week. It also offers training to railway personnel, customers, community members, and first responders to help manage incidents and develop emergency response plans (RAC 2016). The closest dangerous goods office to the Skeena subdivision is located in Prince George, BC. The environmental team is responsible for containing and addressing any environmental effects of the spill. The offices closest to the Skeena subdivision are located in Prince George and Smithers. There are two transfer and response units and fire trailers in Terrace, and a mobile transfer and response unit in Prince Rupert. Western Canadian Marine Response Corporation also provides CN with spill response services out of Prince Rupert and along the Skeena River to Terrace.

There are various safety standards practiced for community safety that CN recommends (CN Rail 2020a), including but not limited to:

- Monthly inspections of the tracks to ensure they are in functioning conditions. Inspections may include ensuring gauges are 56½ inches, alignment is less than 5 inches, and crossties, rails, and track surfaces are in proper condition.
- CN recommends maintaining railway conditions for:
  - Drainage – maintenance of ballast, rocks, ditches, and pipes particularly at crossings.
  - Vegetation – clearing excess vegetation growth on tracks.
  - Obstruction – removal of debris from the railways to provide safe conditions.
  - Fencing – ensure adequate fencing exists along properties where required.
  - Bumping posts – located at proper distances and secured.
  - Road crossings – maintenance of rail joints, flangeway space, and sightlines.
- In cold weather, trackside walkways must be sanded or salted to ensure safe work conditions. Snow windrows must also be cleared by four to five feet to allow for safe and proper inspection of the train before movement.
- All workers (e.g., operators, maintenance crews) must have a railway operating certificate.
- Locked rail tracks.

4.1.2 Rail Capacity

The rail tracks in the Skeena subdivision have a weight limit of 286,000 lbs., which is the highest weight limit currently in use by CN in Canada (CN Rail 2020b).

5 Existing Rail Operations

This section presents existing rail traffic volumes, incident rates related to moose strikes and derailments, and wait times at key rail crossings within the defined rail corridor.

5.1 Existing Volume

There are approximately 15 freight trains per day on the Skeena subdivision line, however, the number of trains is subject to change depending on the needs of CN customers (CN Rail pers. comm. 2019a). The line operates 24 hours per day and does not work on a set schedule. Using a mean of 15 trains per day, the annual number averages 5,475 trains per year. Train traffic includes goods transiting to and from the various PRPA shipping terminals including:

- Container goods
- Liquid propane
- Forestry products
- Recyclables
- Automotive components
- Coal
- Grain

The railway handles over 95% of cargo traffic from PRPA terminals (PRPA 2017), with the remainder of traffic classified as passenger traffic.

5.2 Incident Rates

5.2.1 Moose Strikes

The BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) provided data for wildlife strikes between Gitaus and Prince Rupert, which was submitted by CN between 2008 and 2018 (and partial for 2019) (Thiessen et al. 2013). Those data (**Table 1**) represent strikes between moose and trains that do not necessarily result in the immediate death of the animal. There is evidence that railway reports may not reflect the actual number of kills. It is estimated only 58% of fatalities are reported (Marshall 1987). The distance between Prince Rupert and Gitaus is approximately 177 km by rail, and CN currently operates approximately 15 trains per day between Gitaus and Prince Rupert, or 5,475 trains per year. It was assumed that traffic volume has been consistent between 2012 and 2018 for analysis purposes.

The number of moose strikes reported within the Skeena subdivision between 2012 and 2018 totaled 26 animals (range of 0-11 each year, average of 3.7 ±1.6 [mean ± SE] animals per year). The number of strikes per km ranged from 0 to 0.06 moose each year during the same period peaking in 2016 with 0.0620 moose strikes per km (**Table 1**). The number of moose strikes per train ranges from 0 to 0.002 moose per train.

If the correction factor of 0.58 is applied, whereas only 58% of strikes are reported (Marshall 1987), the average annual number of moose struck between 2012 and 2018 may be as high as 6.4 animals or 0.0012 moose per train.

Table 1: Moose Strikes Reported by CN between Gitaus and Prince Rupert (Thiessen et al. 2013)

Year	No. Moose Strikes	Moose Strikes Per Kilometre	Moose Strikes Per Train (assumes 5,475 trains)
2008	1	0.0056	0.00018
2009	9	0.0508	0.00164
2010	0	0.0000	0
2011	2	0.0113	0.00037
2012	2	0.0113	0.00037
2013	1	0.0056	0.00018
2014	0	0	0
2015	1	0.0056	0.00018
2016	11	0.0620	0.00201
2017	3	0.0169	0.00055
2018	8	0.0451	0.00146
2019 (partial year)	4	0.0226	0.00073
Annual average (2008-2018)	**3.45**	**0.019**	**0.00063**
Annual average (2012-2018)	**3.71**	**0.001**	**0.00068**

A summary of moose strikes from 2008 to 2018 is as follows:

- Between 2008 and 2018, 54% of moose strikes occurred during the winter (defined as the four months between December and March).
- 7 moose strikes occurred during the winter of 2016.
- 6 moose strikes occurred during the winter in 2018.
- 4 moose strikes occurred during January 2019.
- Moose strike collisions in BC increase through fall and peak in January and February (Child et al. 1991).

5.2.2 Other Incidents

The most hazardous types of rail incidents are main-track collisions and derailments. These incidents pose severe risks to the public, can release dangerous goods into the environment, and are the largest economic loss for rail lines. A derailment along the Skeena subdivision could result in the release of deleterious substances into surrounding waterbodies, including the Skeena River. In turn, this could affect aquatic life and resources. Moreover, if a spill occurs during a fish migration window (e.g., salmon and Eulachon) the effects could be detrimental to the fish, fish habitat, and those who rely on fish as a resource.

The Transportation Safety Board of Canada indicates the 10-year average (2008-2018) of CN main-track derailments in Canada was 85 per year. In 2018, CN rail had 88 main-track derailments, with 20% (approximately 17) occurring in BC. Between 2013-2017, BC averaged 14 main-track derailments, 70 non-main track derailments, and 126 accidents that involved dangerous goods, of which five resulted in a leakage (Transportation Safety Board of Canada 2019a).

Data provided from the Transportation Safety Board of Canada (2019a) indicates the following statistical baseline of incidents over the 15-year period from 2004 to 2019:

- 6 main track derailments (average of 0.4 per year).
- 24 non-main track derailments (average of 1.6 per year).
- 2 fatalities (average of 0.13 per year).
- 5 serious injuries to the public (average of 0.33 per year).
- 2 serious injuries to CN employees (average of 0.1 per year).
- 3 collisions with an object (average of 0.2 per year).

Broken rails are the primary cause of train track derailments. According to the rail occurrence database (2004-2019) for the Skeena subdivision (Transportation Safety Board of Canada 2019b), there were a total of six main-track derailments:

- 2006 – Mile 43
- 2013 – Mile 85.68
- 2014 – Mile 48.5
- 2016 – Mile 68.1
- 2018 – Mile 91.8 (two incidents recorded at same location)

None of these rail incidents caused injuries, fires, explosions, or evacuations.

There were two incidents involving dangerous goods (2004 and 2007) that did not result in a release to the environment. Since 2004, there have been two fatal injuries (2016 and 2017), five serious injuries to the public (2004, 2009, 2012, 2015, 2017), and three trespassing incidents (2004, 2010, 2011) in the Skeena subdivision. Other CN rail occurrences in the Skeena subdivision during the 15-year period studied involved one collision with a track unit, two employee accidents, nine incidents where movement exceeded limits of authority, five non-main track collisions, 24 non-main track derailments, and three collisions with an object (e.g., abandoned vehicle) (Transportation Safety Board of Canada 2019b).

Despite these incidents, the Railway Association of Canada (RAC) indicates 99.9% of trains carrying dangerous goods safely reach their destination (RAC 2016).

5.3 Wait Times

There are various grade crossings within the Skeena subdivision. These grade crossings are governed by the Grade Crossings Regulations under the *Railway Safety Act* mandated by Transport Canada and are defined as “public grade crossings”. Public grade crossings are locations where “…railway tracks intersect with a road that is owned, open and maintained by a public authority like a province, municipality or band council, and is used by the public.” Wait time limits associated with public grade crossings are found in *Section 97 (2)* of the Grade Crossing Regulations:

> *(2) It is prohibited for railway equipment to be left standing on a crossing surface, or for switching operations to be conducted in a manner that obstructs a public grade crossing – including by the activation of the gate warning system – for more than five minutes when vehicular or pedestrian traffic is waiting to cross it.*

The wait times at key public grade crossings along the Skeena subdivision varies depending on the amount of rail car units in use. The wait times typically range from five to 25 minutes at key crossings in Terrace, Port Edward and Prince Rupert (CN Rail pers. comm. 2019a). There are a total of nine public grade crossings in Gitaus, two public grade crossings and one overpass in Terrace (**Photograph 1** and **Photograph 2**), four public grade crossings in Port Edward and 16 in total in the geographic area encompassing the North Coast and Kitimat-Stikine regional districts. Enough substantiated data cannot be obtained without further on-going, long-term studies. Total tonnage in 2020 has increased 8% over the same period last year (January to June 2019) (**Table 2**; PRPA 2020). Increased train traffic due to higher volumes of export traffic generated through PRPA Terminals indicates there is likely to be more frequent wait times at the Mile 28 and Highway 16W level crossings even without the proposed Project.

Table 2: Export Cargo Volumes 2019 and 2020 in Tonnes (PRPA 2020)

Terminal	2019 Annual Exports (January to June)	2020 Annual Exports (January to June)	Change (+/-)
Westview Terminal	543,041	668,807	+ 23%
Ridley Terminal	4,820,227	6,804,219	+ 41%
Prince Rupert Grain	3,039,586	2,762,588	- 9%
Fairview Terminals	5,508,080	4,806,906	- 13%
		Total PRPA Terminals	**+ 8%**

Photograph 1: Mile 28 Grade Crossing at Highway 16W

Photograph 2: Terrace Grade Crossing at Highway 16W Kenney Street

6 Projected Rail Traffic

6.1 Future Rail Traffic Without the Project

The reasonably foreseeable Projects and activities that will contribute to increased rail traffic within the Skeena subdivision include:

- Fairview Container Terminal Phase 2 (Port Strategy 2018):
  - Will expand on the dock rail capacity with the addition of 6,680 feet of rail track by 2022.
- Ridley Island Export Logistics Facility (Stantec 2020):
  - An intermodal transloading capacity of 400,000 TEU per year in phase one, and 900,000 TEU for export in phase two.
  - 100-120 rail cars per train.
  - Three trains per day in phase one, and up to 4.5 trains per day in phase two.
- Pembina Prince Rupert LPG Export Terminal (Pembina 2020):
  - Small scale rail terminal.
  - Permitted capacity of approximately 25,000 barrels per day of LPG and is expected to be in service mid-2020.
  - Estimated increase in rail traffic of 20-25 rail cars per day.
- Wolverine Terminals – Prince Rupert Marine Fuels Service Project (Wolverine Terminals 2020):
  - Offloading marine fuel from the rail cars into the fuel storage barge.
  - Estimated increase in rail traffic of 10 rail cars per day.
- Ridley Island Propane Export Facility (AltaGas 2020):
  - Capable of shipping up to 1.2 million tonnes of propane per year.
  - Estimated that the terminal will offload approximately 50-60 rail cars per day.

Based on the assumption of 100 cars per train on average, the above projects will increase annual rail traffic 7% from 5,475 trains per year to approximately 5,840 trains per year without the Project.

6.2 Rail Traffic Effects related to the Project

At full Project capacity, the Skeena subdivision will be carrying 240 liquid gas-by-rail cars per day (60 for liquified petroleum gas, 90 for clean petroleum products [e.g., diesel], and 90 for methanol) associated with the Project. An increase of 2.4 trains per day is projected to deliver product to the Vopak facility. The Project will contribute approximately 876 additional trains per year on the Skeena subdivision between Gitaus and Prince Rupert. The annual train traffic will increase from 5,475 trains per year to 6,351 trains per year (16% increase) as a result of the proposed Project (**Figure 3**).

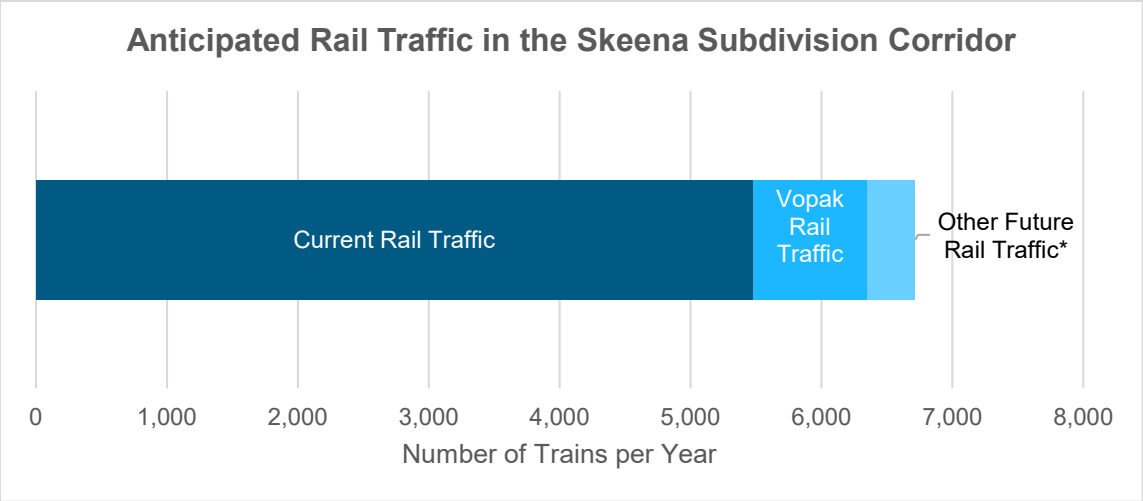

Figure 3: Predicted Increases of Rail Traffic in the Gitaus to Prince Rupert Corridor
***This does not include consideration of the Fairview Terminal Expansion 2b Project.**

6.2.1 Increase in GHG Emissions

Greenhouse gas emissions (GHG) from rail transport of products along the 177.3 km of rail along the Skeena subdivision are estimated to be approximately 19,081 tonnes carbon dioxide equivalent per year (CO_2e/y) until 2030 and 14,263 tonnes CO_2e/y after 2030 (**Table 3**). The GHG emissions associated with rail transport were estimated using the Railway Association of Canada (RAC) annual publications that provide GHG transport emission intensity values on a net cargo basis (revenue-tonne kilometres or RTK) (RAC 2020). The current rail transport intensity measure is 4.65 litres/1,000 RTK for diesel consumption (Environment and Climate Change Canada 2020). CN has a goal of 29% reduction in GHG emissions by 2030, hence the emissions related to rail transport were predicted to decrease by 29% from 2015 levels after 2030 (CN Rail 2019b). This reduction is associated with a draft low carbon fuel standard (Government of Canada 2020) and additionally accounts for efficiency improvements. The estimate assumed an equal volume of gas and diesel is shipped for the CPP total throughput.

Table 3: Estimated GHG Emissions (tonnes CO_2e/year)

Year	Product	Tonnes CO_2e/year
>2030	gas	2,195
	diesel	2,519
	LPG	2,798
	methanol	11,569
	Total	**19,081**
2030+	gas	1,641
	diesel	1,883
	LPG	2,092
	methanol	8,647
	Total	**14,263**

The Locomotive Emissions Monitoring (LEM) Program was created by the RAC to ensure that railways were meeting their commitments to lower GHG intensity reduction targets and working to reduce emissions of criteria air contaminants (CACs). Currently, Canada's entire rail industry, including all rail companies and both freight and passenger trains, produces only one per cent of Canada's GHG emissions (RAC 2016).

6.2.2 Increase in Air Emissions

An increase in rail traffic along the rail corridor is expected to increase rail emissions linearly. This increase would be expected to influence ambient air quality levels in a different way depending on the averaging period considered. The relevant averaging periods are those used in expressing provincial and national ambient air quality criteria (BC ambient air quality objectives [AAQOs] and Canadian ambient air quality standards [CAAQS]). These are hourly, 24-hour and annual averaging periods.

To determine the potential effect on ambient air quality concentrations at these averaging periods, the Project emissions estimates were used to determine the contribution rail emissions have to the Project total emissions, since these estimates include both rail switching as well as line haul (loaded train movement) activities (Vopak 2020). Project emissions are available as the maximum hourly emissions and annual emissions.

The project inventories show the following relative contributions of rail to the project totals, indicated in **Table 4**. Rail emissions are a greater portion of the project totals at the annual averaging period since rail sources are more active on a day to day basis than some of the other sources (like ships).

Table 4: Contribution of rail emissions to project totals

	Contribution to Project total emissions, by contaminant					
Rail activity and time period	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**
Maximum hourly switch	0.4%	0.0%	0.7%	0.6%	0.4%	0.1%
Maximum hourly line haul	1.4%	0.0%	2.1%	2.1%	1.2%	0.4%
Annual switch	8.8%	0.2%	8.7%	8.7%	15.4%	0.4%
Annual line haul	8.7%	0.2%	8.6%	8.3%	15.3%	0.4%

Line haul emissions represented in this comparison are those associated with the movement of loaded trains to and from the Project terminal and therefore are representative of the emission rates of the trains along the B.C. rail corridor. Switching activity occurs at rail yards and large terminals and would not be associated with traffic along the rail corridor. The comparison shows that the line haul emissions are only up to 2% of the hourly project totals and up to 16% of the annual Project totals. The Project rail contribution to the port, community and airshed total emissions would be much lower than these levels. Even for a community with a great deal of rail activity, such as Prince George, the contribution of rail to annual total emissions is just 7% or less (STI 2008).

Assuming linearity between total emission increases and ambient air quality, multiplying the increase in rail activity with the contribution of rail to total emissions provides a measure of the change in air quality that could be expected in any communities along the rail corridor. This approach indicates an increase of up to 0.3% for hourly average air quality concentrations (e.g., 2.1% * 16% = 0.3%), which is not likely measurable. For annual average concentrations, the increase could be as high as 2% (15% * 16% = 2%). However, this estimate is expected to be quite conservative, since rail's contribution to community emissions is expected to be much lower than 16% in virtually all cases. A potential 1% increase in annual average concentrations is considered more representative. It is suggested that the potential change to 24-hour concentrations would be between 0.3% and 1%.

For these reasons, the impact of a 16% increase in rail traffic along the rail corridor is expected to affect ambient air quality concentrations in inhabited areas by up to 1% over current levels, which is not considered significant. Additionally, more stringent air emissions standards for newer locomotives imply that these potential increases may not occur as newer locomotives penetrate the active fleet.

6.2.3 Increase in Noise

An increase in rail traffic along the corridor has potential for increasing noise over longer time periods such as 8-hour averages but no potential for increasing short-term maximum noise levels as short-term levels are associated with single trains passing a location. An estimate of changes to 8-hour noise levels can be made by applying a basic acoustic equation as shown below. To apply these equations, it is assumed that the 16% additional trains have the same model, length, and velocity as existing trains on the corridor.

If an increase in rail traffic of 16% over a period of 8 hours occurs, the increase would be calculated with either of the two equation forms shown below, with each indicating the same result.

- Increase in noise (dBA) = 10*log(1 + [increase % / 100]).
- Increase in noise (dBA) = 10*log(final train number / initial train number).

The result of these two equations is 0.6 dBA. The results are the same if we consider an increase in rail traffic of 16% over a 24-hour period. An increase in noise of 0.6 dBA is generally not considered to be noticeable (Bies and Hanson 2003). Therefore, no noticeable difference in noise associated with the increase in rail movements along the rail corridor is anticipated.

6.2.4 Increase in Wildlife Collisions

The increased train traffic associated with the Project may cause an increase in the number of moose strikes. Given that rail traffic from the Project will increase approximately 16% annually, it was projected that moose strikes will also increase 16% annually. This is projected to increase the average number of moose struck per year from 3.7 ±1.6 to 4.3. ± 1.8 (mean ± SE). MFLNRORD is responsible for managing moose populations in BC. The Lower Skeena moose population unit consists of portions of wildlife management units 6-15, 6-9, 6-3 and 6-10 and is centered on Terrace. The most recent moose survey report for the Lower Skeena moose population unit (Thiessen et al. 2013) estimated 741 moose ± 109 (mean ± SE). The projected change in numbers of moose-rail collisions would not be detectable at the population level. MFLNRORD biologists consider rail and road mortality, as well as winter severity, habitat condition, hunting mortality, predation pressure and calf survival when setting moose harvest targets.

6.2.5 Increase in Incidents

The increased train traffic associated with the Project may also cause an increase in the number of incidents, such as derailments and collisions. Based on the past derailments and a projected 16% increase in rail traffic, the number of main track derailments is projected to increase from 6.0 derailments r over the 15-year period from 2004-2019 to 7.0 derailments over the 15-year period from 2022-2037, with the number of non-main track derailments increasing from 24 to 27.9 over the same period. Within the same time period, the number of fatalities is projected to increase from 2.0 over the 15-year period from 2004-2019 to 2.3 over the 15-year period from 2022-2037, the number of serious injuries to increase from 5.0 to 5.8 , and the number of collisions with an object to increase from 3.0 to 3.5 over the same period.

7 Conclusions

The Project will contribute approximately 876 additional trains per year on the Skeena subdivision between Gitaus and Prince Rupert and increase rail traffic from 5,475 trains per year to 6,351 trains per year. This 16% increase in rail traffic has the potential to cause the following effects in the rail corridor:

- Increase in GHG emissions of approximately 19,081 tonnes CO_2e/y until 2030 and 14,263 tonnes CO_2e/y after 2030.
- Increase in ambient air quality concentrations in inhabited areas by up to 1% over current levels, which is not considered significant.
- No noticeable difference in noise.
- Increase of moose strikes from 3.7 ± 1.6 [mean ± SE] to 4.3. ± 1.8 [mean ± SE] per year.
- Increase of main track derailments from 0.4 to 0.5 per year.
- Increase of human fatalities from 0.13 to 0.15 per year.
- Increase of serious injuries to humans from 0.33 to 0.39 per year.
- Increase of collisions with an object from 0.20 to 0.23 per year.
- Increase in wait times at the Mile 28 and Highway 16 grade level crossings with and without the proposed project due to increased exports through the Port of Prince Rupert.

The 16% increase in rail traffic along the rail corridor is conservatively estimated (i.e., using worst-case assumptions) to affect ambient air quality concentrations in inhabited areas by only up to 1% over current levels, which is not considered significant. The increase is also estimated to result in an increase in noise of only 0.6 dBA over a 24-hour period; an increase which is not considered to be measurable. Based on these estimates, no adverse impacts associated with air quality or noise levels to human health are predicted based on the increased rail traffic.

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