Loading Grain in Inclement Weather: Jurisdictional Scan

Quorum Corporation

Contents

1. The Study’s Mandate

Transport Canada[1] has initiated a working group comprised of representatives from the Federal Government, the grain industry, long shore unions, railways, and the port to explore alternate processes that would allow for increased vessel loading capability during periods of rain. In support of the working group efforts, the objective of this study is to provide a jurisdictional scan of ports and terminals which export grain cargoes or other rain sensitive cargoes, such as potash, and document which ports and terminals (if any) conduct loading of vessels from marine terminals during rainfall and how they approach the operation, including addressing safety concerns and impacts to cargo quality.

2. Background and History of the Issue

Since 2007 the issue of loading grain vessels in the rain has been in dispute between the International Longshoremen’s and Warehousemen’s Union (ILWU) and British Columbia Maritime Employers Association (BCMEA) at the Port of Vancouver[2]. In the early days of the dispute, the BCMEA’s contention was that inclement weather does not allow an exception to the provision of ‘Uninterrupted Operations’ within their collective agreement, while the ILWU’s stance was that loading through a tarped hold or through feeder holes is unsafe and crews can refuse any work that endangers them[3]. In March 2011, an impasse was reached which led to strike action taken by the ILWU, followed shortly by an application by BCMEA to the Canada Industrial Relations Board (CIRB) to seek a resolution. In Decision 2011 CIRB 578 (April 7, 2011), it was concluded that the “differences between the BCMEA and the ILWU result mainly from their differing views over the collective agreement and ancillary documents”[4], so the application was deferred to be resolved through arbitration as outlined in their collective agreement. While awaiting a resolution, loading grain during inclement weather was permitted, though it was seldom done as the concerns of both parties remained.

Arbitration reached a decision in 2017 with a set of safety conditions and protocols to be put into place when loading grain vessels in rain/snow. The key requirements set forth in the arbitrator’s decision are summarized as follows:

- Guardrails must be used when feeder hole or tarping operations are performed on a hatch from which there is a drop of more than 1.2 meters.
- If guardrails are not reasonably practical for feeder hole loading or tarping, a fall protection system is required.
- If work is performed close to the hatch cover edge, outside the guardrails, or near an open hatch the employee must be provided with fall protection equipment.
- Every employee who may be required to use fall protection equipment must be provided with the information, instruction, training, and supervision necessary to safely use all the fall protection equipment prescribed.

This decision stopped all loading during the rain until the safety conditions were met in late 2019. Acquisition of the guardrails and fall protection equipment began immediately following the ruling and was largely complete

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1 The Study was conducted for Transport Canada’s Pacific Region. The work on process exploration and development for loading during inclement weather has continued within Transport Canada’s National Supply Chain Office since December 2023.

2 Refer to Appendix A for a timeline of the dispute.

3 Canada Industrial Relations Board, Decision 2011 CIRB 578, II–Facts and Parties’ Positions https://decisia.lexum.com/cirb-ccri/cirb-ccri/en/item/5754/index.do

4 Canada Industrial Relations Board, Decision 2011 CIRB 578, IV-Conclusion

within a year while the final step of establishing policies, procedures, and training documentation continued through 2019.

Since 2020, the procedures have been in place to allow for loading grain vessels in the rain and the option to do so is available to grain terminals, though the terminal operators have found it more efficient not to. Setting up guardrails or fall arrest systems to safely load at height requires an additional 2-4 hours and four additional crew members for mobilization and de-mobilization. This increase in time, along with the associated increase in labour costs, falls well short of the benefit gained by continued operations through periods of rainfall. Furthermore, terminal operators report that often rain will cease during the time it would have taken to set up, so opting not to begin the procedure avoids the incursion of unnecessary labour costs when rain is intermittent.

3. Weather Comparison

Vancouver BC and the Pacific Northwest (PNW) cities have similar patterns of precipitation, described by which months typically see more rainfall and how many hours have rainfall. However, they differ in the volume of precipitation received and frequency with which it occurs. Vancouver BC had significantly more total annual precipitation and average monthly precipitation, while Portland OR had the largest number of prolonged periods of rainfall.

The impact that inclement weather has on port operations is more strongly determined by the frequency and duration of rainfall than by the volume. Terminal operators at Vancouver BC all asserted that shipmasters routinely call for loading to cease in any amount of precipitation. Vancouver BC typically receives between 15-50% more total annual rainfall than the PNW, but this does not create substantially more lost time when rainfall duration is the determinant factor. In fact, regions within the PNW tend to receive more frequent rainfall though it is at a lower average intensity.

The rainiest months coincide with the peak shipping period on both sides of the border. October through March exhibit the highest frequency and intensity of rainfall, with 23-30% of all hours during the peak season having some volume of precipitation. Most rainfall occurs at trace or light intensity, below 2.5mm/hr, in all regions.

Variations within a few percentage points, especially at an hourly frequency, are unlikely to cause a large operational difference between the regions. There remain many factors which are difficult to quantify or measure that affect the amount of grain loaded onto vessels, with rainfall being only one of them. The supply chain for terminals will be at various stages such that not all export programs are affected equally by a rain event.

3.10 Weather Analysis

3.11 Rainfall Intensity

Weather stations in Canada and USA use different precisions of measuring and reporting precipitation values. Canadian stations report in tenths of a millimetre, while US stations report in hundredths of an inch (0.254mm). Volumes below 0.01 inches may get reported as ‘trace’, denoting that there was some precipitation but not enough to record. To better align the comparison between countries, hourly precipitation volume at Vancouver BC of 0.1 or 0.2mm (equivalent to 0.004 or 0.008 inches) have been adjusted to ‘trace’. The effect of this adjustment is an average reduction of 45mm/year reclassified from light to trace intensity at Vancouver BC.

Rainfall Intensity	Precipitation Range
None	0.0mm/hour
Trace	0.1 to 0.2mm/hr
Light	0.3 to 2.5mm/hr
Moderate	2.6 to 7.5mm/hr
Heavy	7.6mm/hr or more

Rainfall intensity categories follow the guidelines set by Environment and Climate Change Canada, except for the adjustment made to include trace amounts.

3.12 Portland, OR & Vancouver, WA

The best situated climate stations for assessing the conditions at Portland and Vancouver grain terminals are their respective airports, separated only by the Columbia River – approximately 5km apart. The two stations exhibit nearly identical precipitation patterns, so this report has opted to only include Portland as the international airport had more complete data throughout the report period.

3.20 Regional Comparisons

3.21 Volume

During the period examined[5], Vancouver British Columbia (BC) typically received 15-50% more annual precipitation than then Pacific Northwest (PNW) cities (Figure 1). All cities, however, exhibited the same seasonal patters of rainfall, with the peak months occurring from October through March (Figure 2).

Portland and Seattle had the lowest amount of total annual rainfall in each of the seven years (Figure 1). Longview, with one of the largest grain export terminals in the region at EGT, saw the highest volume of rainfall of any of the USA cities but still had an average of 28% less total annual rainfall than Vancouver BC.

A time-series of total monthly precipitation (Figure 2) shows very little difference between the seasonality in rainfall volume at each of the cities. The amount of precipitation rises sharply in October each year before dropping back down after March. The average monthly precipitation recorded throughout the report period (Figure 3) highlights seasonal trends and differences in volume. As with the total annual volume, Vancouver BC saw significantly more

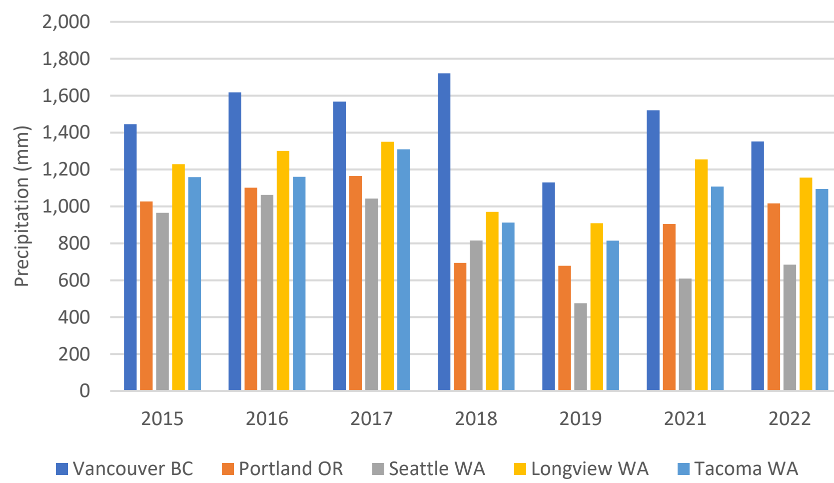


Figure 1 – Total Annual Precipitation

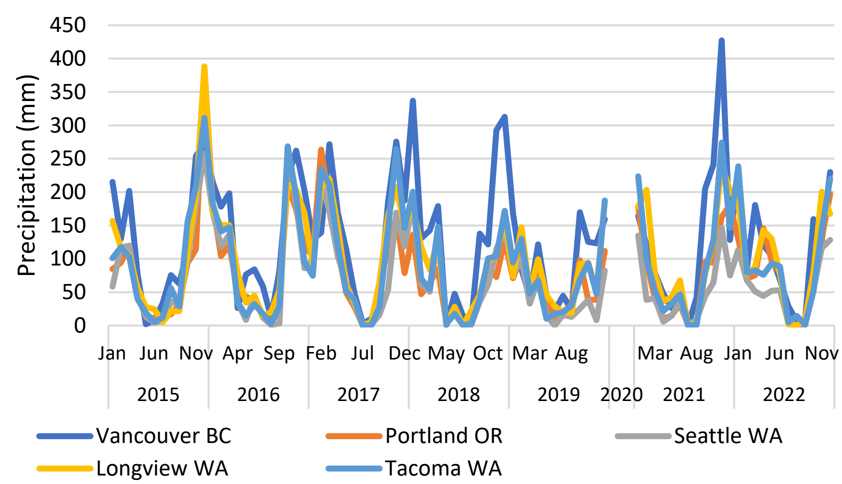


Figure 2 – Total Monthly Precipitation Time Series

[5] The weather period examined is January 1, 2015 through December 31, 2022 excluding all of 2020. Refer to Appendix B for more details.

total rainfall than any of the USA cities, with one exception being that Tacoma WA averaged higher precipitation in February.

Separating the year into two 6-month periods, the peak shipping period of October through March, and the off-peak period of April through September, shows a notable difference in the average amount of daily precipitation (Figure 4). Every city had more than 3x the amount of average daily rainfall during the peak shipping season than they do throughout the rest of the year.

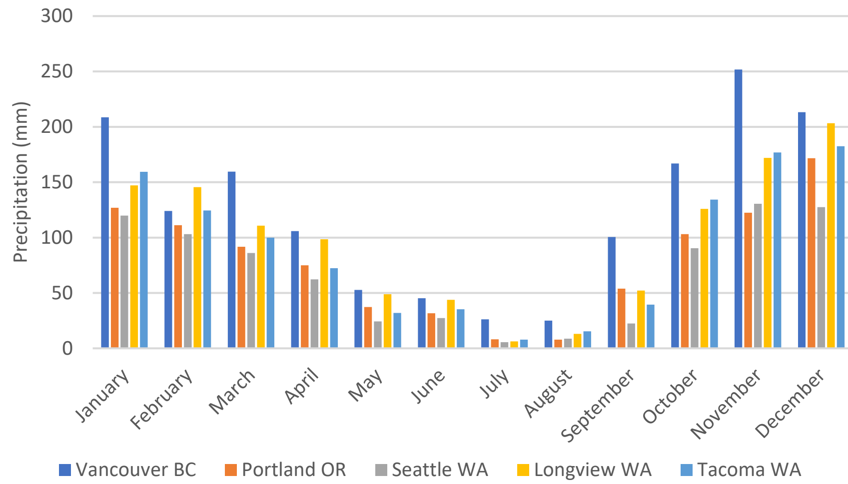


Figure 3 – Average Monthly Precipitation During the Report Period

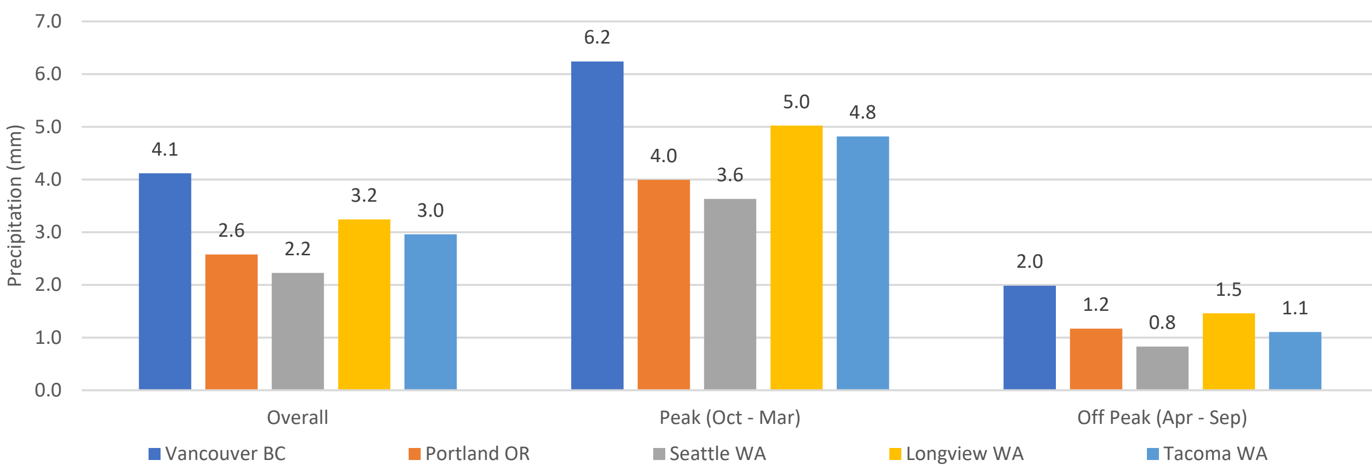


Figure 4 – Average Daily Precipitation by Shipping Period

3.22 Frequency

Approximately half of all days had some volume of precipitation at all cities examined (Figure 5). The ranking of cities by days with precipitation varies annually, though Longview consistently ranks as one of the rainiest, and Vancouver one of the least rainy cities.

When considering precipitation by hour (Figure 6), there were far fewer hours with rainfall, ranging from 12-24%. This stark disparity between the daily and hourly proportions highlights that rain is inconsistent throughout a day. Terminal operators in BC have confirmed this

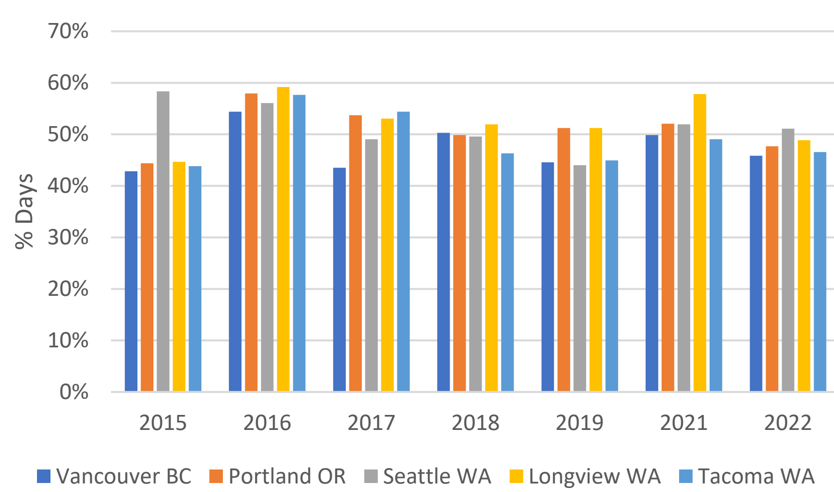


Figure 5 – Proportion of Days with Precipitation by Year

pattern of rainfall and it contributes to their reluctance to make use of existing remedies for loading in the rain. Often, a terminal can wait a few hours for clear weather conditions and resume loading at full rates (see Section 4).

The variation between days and hours with rainfall is even more pronounced between the peak and off-peak seasons (Figures 7 & 8). Between April and September, precipitation occurred during only 28-35% of days and 8-11% of hours. The peak shipping period, however, saw on average between 60-72% of days and 21-29% of hours with rainfall.

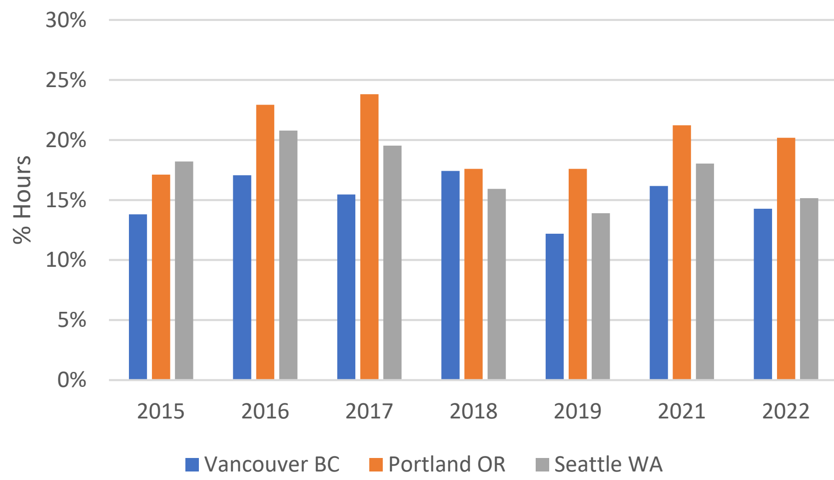


Figure 6 – Proportion of Hours with Precipitation by Year

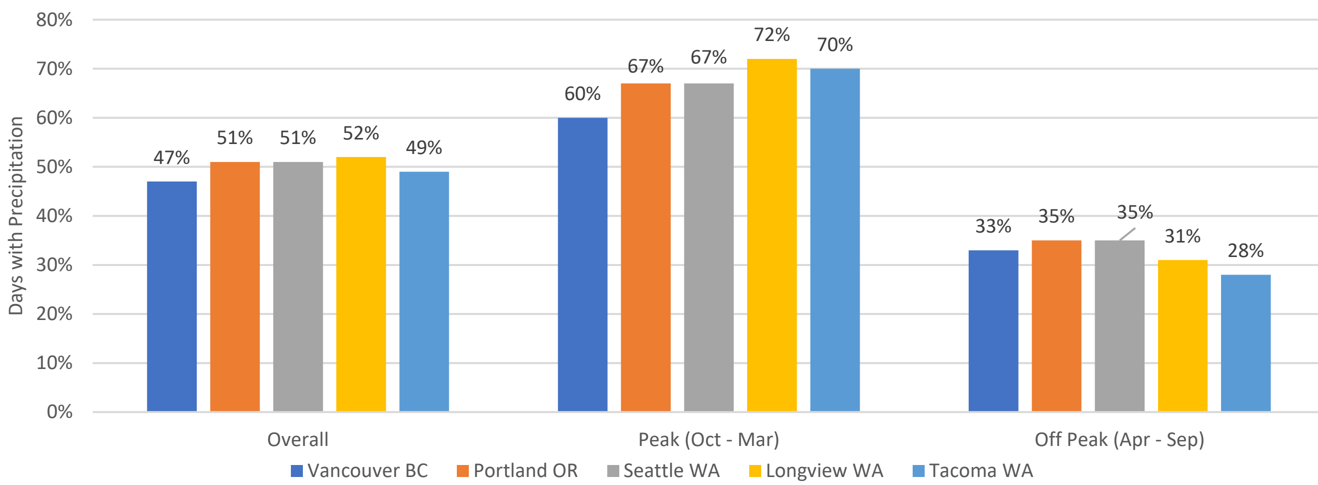


Figure 7 – Proportion of Days with Precipitation by Shipping Period

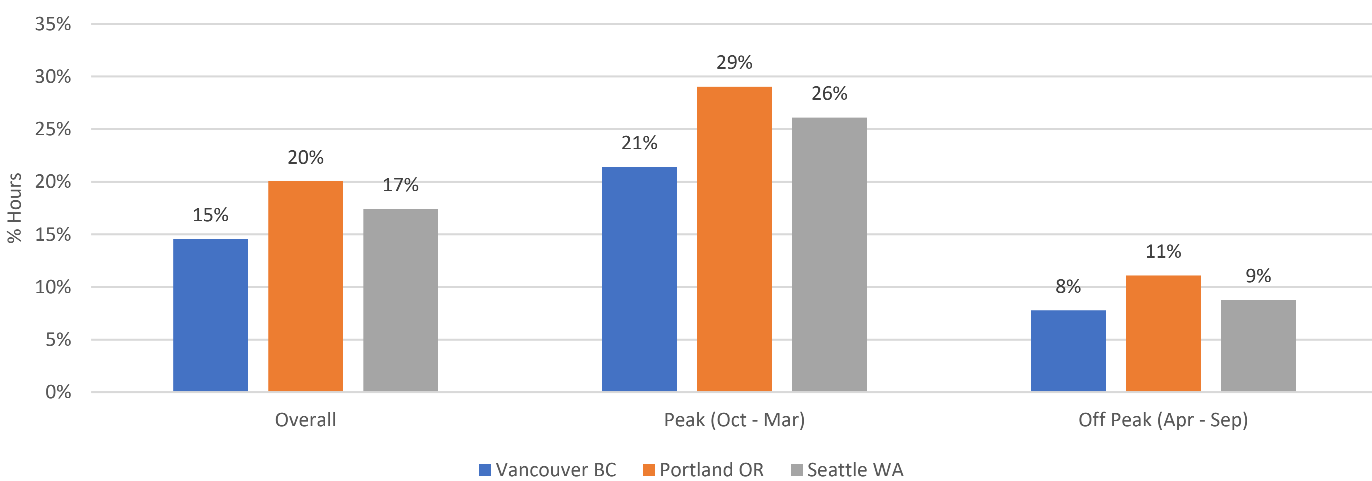


Figure 8 – Proportion of Hours with Precipitation by Shipping Period

3.23 Intensity

Given that Vancouver BC has higher volume but lower frequency of precipitation than the PNW, it is no surprise that rainfall is more intense. The average hourly rate across the report period was 42% higher for Vancouver than for Portland or Seattle (Figure 9). The average hourly rate of precipitation had little variation between the peak and off-peak seasons, indicating that increased volume seen between October and March is on account of increased frequency and/or duration of inclement weather.

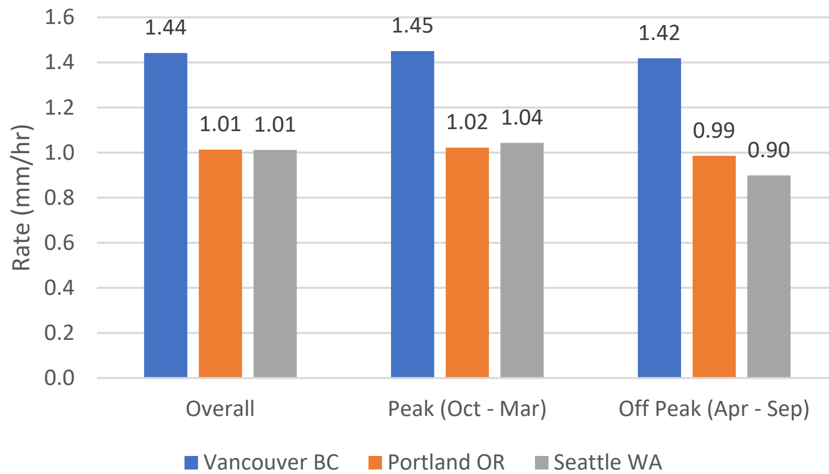


Figure 9 – Average Rate of Rainfall by Shipping Period

The largest difference in intensity between BC and PNW cities lies with how many hours fall under “None” or “Trace” rainfall intensity (Figure 10). Vancouver faced significantly fewer hours of rainfall below 0.2mm/hr – 3.8% against 9.9% and 9.1% observed at Portland and Seattle, respectively. The gap between regions in trace intensity accounted for most of the variance in hours without any precipitation (Figure 10).

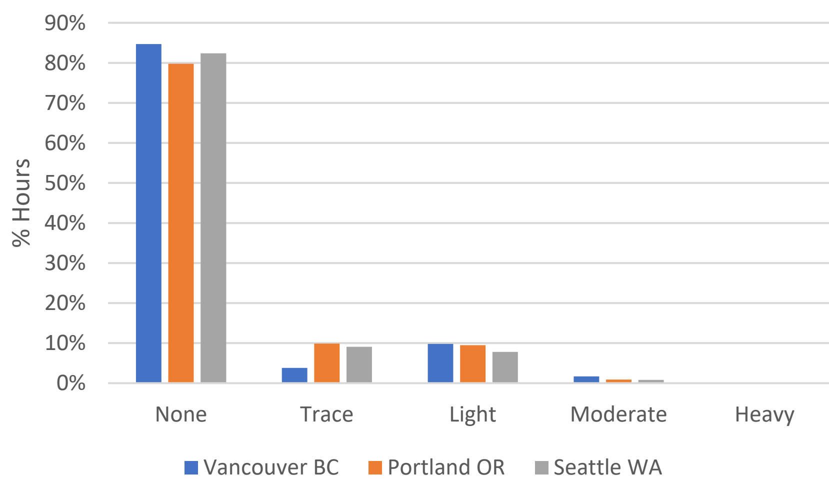


Figure 10 – Distribution of Hours by Rainfall Intensity

3.24 Periods of Prolonged Rainfall

Grain terminals each have varying ability to mitigate the impact of inclement weather (Section 4) such that there isn’t one standard definition of a period of prolonged rainfall. Terminal operators at Vancouver BC, however, all agreed that the duration of rainfall is more significant than the volume or intensity. To that end, the various terminals provided a range from as low as 8 hours in one day to up to 3 days of rainfall as sufficient to cause undue delays in ship loading and impact third parties, such as rail. Each terminal’s operations vary with the size of their export and rail programs, and tolerance for rain delays vary along with it. At some points throughout a year, a terminal may be able to continue unloading rail during 2-3 days of continuous rainfall, while at others they would be congested after only one day.

Table 11 examines different thresholds for periods of prolonged rainfall across the ports included in the jurisdictional scan with available hourly precipitation data. Each table provides the count of occurrences, based on the number of consecutive days with eight or more hours of rainfall, across the seven-year report period. Multiple thresholds are provided to represent the diverse operating conditions present among grain terminals.

Overall, the three ports examined rank with Portland having the most frequent and longest duration occurrences of prolonged rainfall, followed by Seattle then Vancouver.

	1+ Days Consecutive		**2+ Days Consecutive**		**3+ Days Consecutive**	
	# Occurrences†	*Avg. Days*	*# Occurrences*	*Avg. Days*	*# Occurrences*	*Avg. Days*
Vancouver BC	354	1.7	148	2.7	61	3.7
Portland OR	372	2.3	193	3.4	113	4.5
Seattle WA	342	2.0	167	3.0	81	4.1

Figure 11 – Prolonged Periods of Rainfall with 8+ Hours/Day, by Count of Consecutive Days
† # Occurrences is the total count of prolonged periods across the 7-year report period.

3.30 Global Comparisons

Quorum has identified five international ports with potentially similar export volume as Vancouver to compare long-term precipitation averages. Export volumes from specific ports are not generally available, but the countries under consideration are all major grain exporters.

The global comparison consists of Vancouver, two ports from USA, and one from each of Argentina, Brazil, and Russia.

3.31 Volume

Vancouver had the highest annual rainfall between 1991-2021 at an average of 2,351 mm/year (Figure 12), followed by Paranaguá, Brazil with 2,154 mm/year. Novorossiysk, Russia, had a much lower average than any of the other cities at 633 mm/year.

Vancouver, Paranaguá, and Portland have the same pattern of higher precipitation between October and March, and large variance between seasons (Figure 13). Buenos Aires and Novorossiysk see much less variance month-to-month but otherwise follow similar seasonality. New Orleans has rainier summers than winters, with peak months for rainfall of June through September.

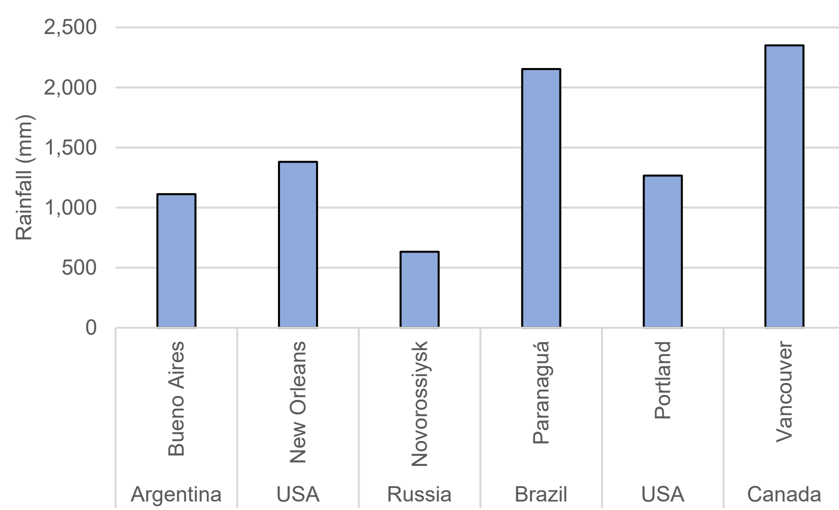


Figure 12 – 30 Year Average Annual Rainfall

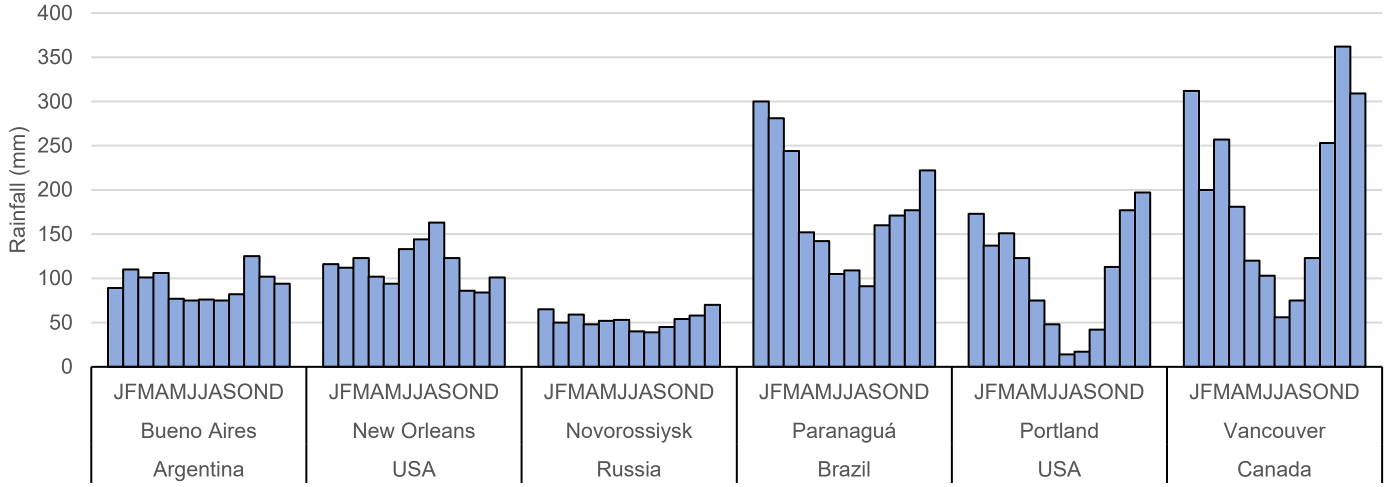


Figure 13 – 30 Year Average Monthly Rainfall

3.32 Frequency

Paranaguá, with an average 160 days of rainfall per year, has the most frequent rainfall (Figure 14). Vancouver has the second highest frequency with 128 days, 20% less than Paranaguá, despite the higher average annual volume recorded at Vancouver. This suggests that, as observed in the regional comparisons, Vancouver has more intense rainfall. In contrast, Novorossiysk logged the lowest annual rainfall but was not the bottom rank by frequency, suggesting a lower average intensity than other regions. Average monthly days with rainfall (Figure 15) very closely follows the seasonal pattern seen in other measures.

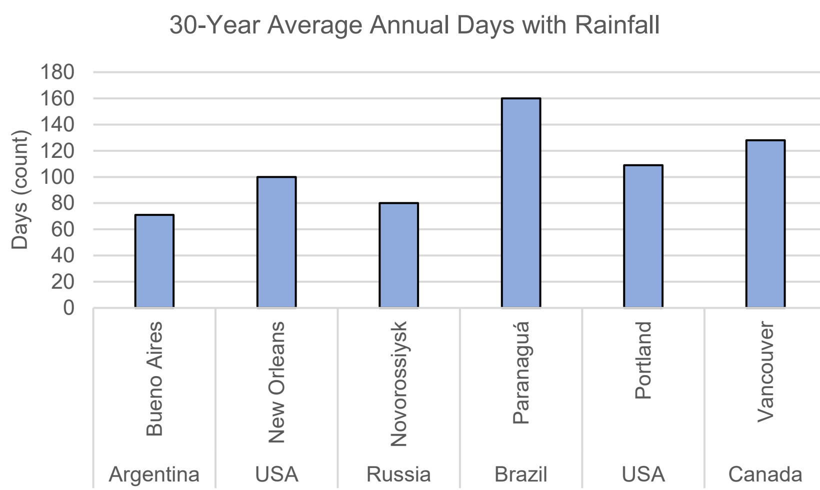


Figure 14 – 30 Year Average Annual Days with Rainfall

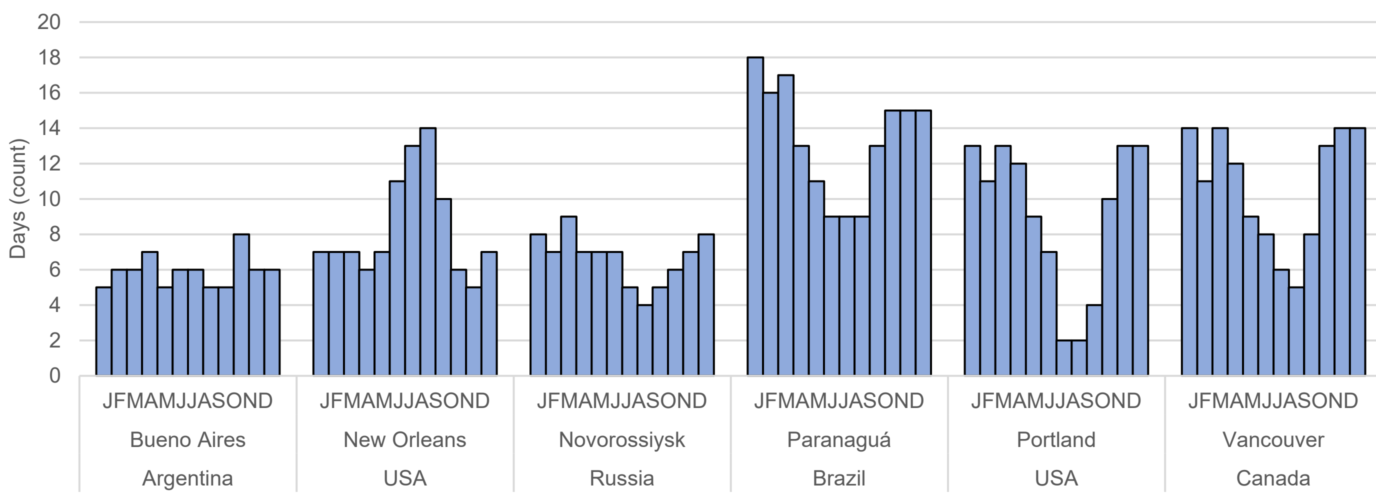


Figure 15 – 30 Year Average Monthly Days with Rainfall

4. Vancouver

4.10 Terminals

There are seven grain terminals in the Port of Vancouver, with nine berths among them. In addition, there are two bulk commodity terminals that handle grain, leading to a total of 11 berths capable of exporting grain.

North Shore:

- Cargill is a sole owned and operated terminal with two berths.
- Fibreco, owned by forest products company Tolko, has added storage and loading capability for grain products.
- G3 Vancouver Terminal is a joint venture between Bunge, SALIC, and Western Stevedoring.
- PKM Canada Marine Terminal, a bulk products handler owned by Pembina Pipeline Corporation, loads agriculture products at their berth #5.
- Richardson solely owns and operates their terminal.

South Shore:

- Alliance Grain Terminal has two berths and is a joint venture between Parrish & Heimbecker, Paterson GlobalFoods, and North West Terminal.
- Cascadia terminal is a joint venture between Viterra and Richardson.
- Pacific terminal is solely owned by Viterra.

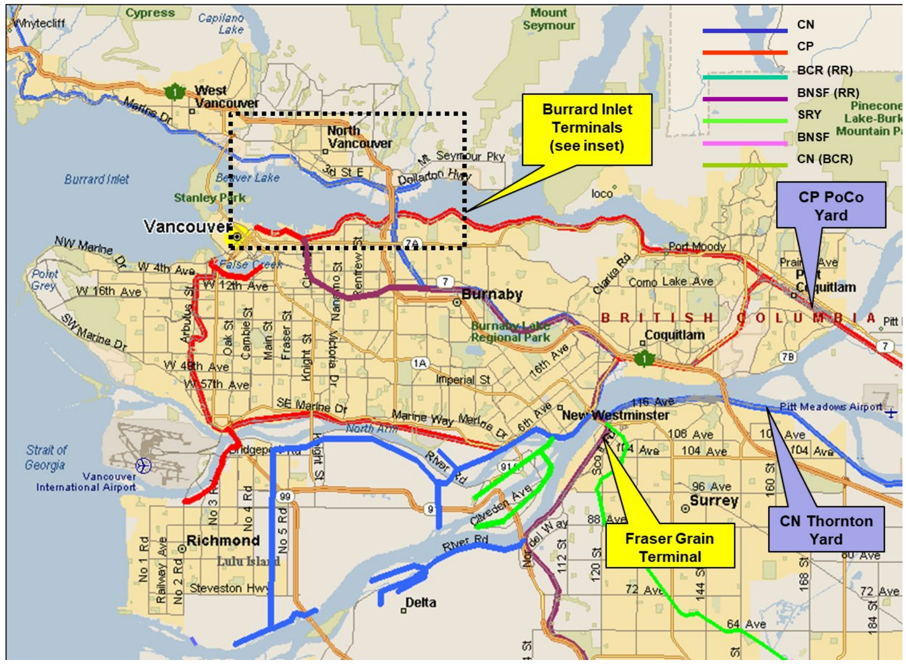


Figure 16 – Greater Vancouver

Figure 17 – Burrard Inlet Terminals

Fraser River:

- Fraser Grain Terminal is a joint venture between Parrish & Heimbecker and GrainsConnect Canada.

The Vancouver terminals typically have one of two styles of ship loader – either vertical (Figure 18) or angled pipe (Figure 19).

Figure 18 – Vertical Ship Loader
Photo Credit: Quorum Corp.

Figure 19 – Marine Spout Ship Loader
Photo Credit: Quorum Corp.

4.20 Loading in the Rain Operational Overview

In the current environment, with few exceptions, grain loading ceases immediately during inclement weather at the ship master’s demand. Grain terminal operators indicated that the only time loading continues during light rainfall is when the last hold was nearly full and completing it would allow the vessel to depart Vancouver. In all other circumstances, the ship master would call for loading to cease in any amount of precipitation – from a light mist through to heavy downpour. The reason for halting is to protect the quality of the cargo as additional moisture can cause grain to go out of condition during transit. Inspectors with the Canadian Grain Commission will also, on occasion, recommend that loading cease, however most terminals stated that by then they will have already begun that process due to the ship master’s call.

When a vessel stops loading, the vessel will almost always remain at berth until loading resumes. Pilotage costs & time to swap to another vessel are not conducive to forcing the vessel off berth in favour of another one that will load in the current weather. Even without the additional expense, it requires that a second vessel for the terminal, and the grain to fill it, are both available. To be sure, there are occasions where a vessel will be moved off berth during inclement weather – either to load another willing vessel, or to prepare the next vessel in the lineup because the sequence of inbound grain requires offloading specific commodities or grades to ensure there is receiving capacity.

When the ship master calls for loading to stop during rainfall, a grain terminal may be able to obtain agreement to continue loading into the open hatches if they are willing to accept the financial risk associated with potential degradation in grain quality[6]. The prevailing sentiment among terminal managers was that no one is willing to undertake that additional risk, primarily because loading rates are sufficiently high that the terminal can “catch up” during the breaks between rainfall. There is, therefore, no need to expose the shipper to additional financial risks when the sales program will still be met.

To continue loading during inclement weather a terminal must make use of the only practical remedy available, which is loading through feeder holes. Tarping over the hold is not performed at any terminal and every manager

[6] Referred to by industry as a “letter of indemnification” which absolves the ships master and ship owner of any liability stemming from a potential degradation of the grain caused by rain entering the hold of the vessel and places the liability on the terminal.

expressed that there is no desire to return to that method. Tarping offered better loading rates and fill capacity than feeder hole loading, but the circumstances that led to its usage have passed and are not likely to return. There was sentiment that a similar method that covers the hold without requiring labour working at height or near open hatches would be an attractive option, provided the setup time was within an hour. An extreme example of such a system would be the covered berth face at the TEMCO terminal in Tacoma, WA (see Section 5.10)

4.30 Loading through Feeder Holes

Feeder holes, present on only about 60% of bulk carriers calling to Vancouver, are circular openings into the ship's holds which can accommodate a loading spout, occasionally with an additional piece of equipment to block water from entering if the loader does not completely cover the hole on its own. Due to the smaller opening and inability to reposition the loading arm, loading in this manner is limited to 30-40% of the usual rate, and each hold can only reach 70% of it's capacity. While loading through a feeder hole, frequent measuring of dust opacity is required. <u>Grain dust is explosive in confined spaces</u>, so it is imperative to mitigate any danger during feeder hold loading which does not have open air to dissipate dust. Opacity measurements inform the rate at which grain is loaded by requiring it to slowdown to keep dust within the safe range. There was some concern that how opacity is measured is not scientific, leading to inconsistent measurements which make it difficult to determine if engaging in feeder hole loading will be worth the effort.

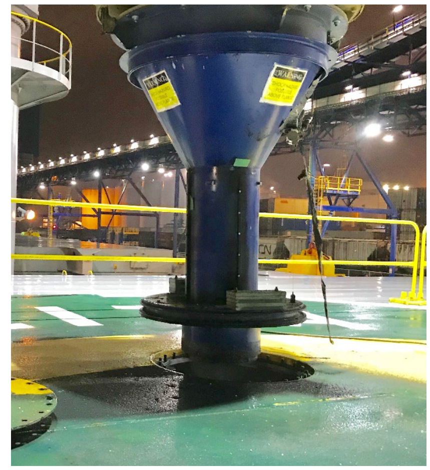


Figure 20 – Loading through feeder hole
Photo Credit: Viterra

Another challenge faced by terminals when attempting to use feeder holes is the setup time. An additional gang must be ordered for loading in the rain operations, which takes 1-2 hours to arrive, followed by 2–4 hours of setup time. Terminals which utilize feeder holes for loading during inclement weather have observed total setup times ranging from 2-5 hours, with crew familiarity cited as a critical element in reducing the setup time. Demobilizing from the setup has a similar timeline of 2-4 hours. The additional labour can be ordered ahead to speed the process up by having crew and equipment staged for when rainfall begins, though terminals are reluctant to advance order to avoid paying for unused labour should it not rain, or, as is often the case, it rains for only a short duration.

Extensive setup times, restricted loading and fill rates, additional labour costs, and vessels without feeder holes all contribute to the infrequent usage of this remedy. Rainfall at Vancouver is generally intermittent so waiting for rain to end is often determined to be the more efficient option. The configuration of each terminal leads to varying degrees of impact due to inclement weather and divergent benefits for making use of feeder holes to continue loading. A terminal with a vertical loader will find using the setup easier than one with a marine spout. A terminal with reduced capacity to continue receiving railcars, whether it be due to infrastructure reasons (i.e. less licensed storage) or operational reasons (i.e. during a busy season), will find it more important to mobilize for loading during inclement weather regardless of the challenges.

4.40 Other Considerations

The meetings with Vancouver terminal operators provided insight into other aspects of loading in the rain that do not relate specifically to remedies that allow for continued loading. These are summarized as follows:

- Grain terminals expressed varying levels of tolerance for additional labour costs that allow for loading in the rain, again related to their specific operating conditions. The tolerance will vary with the current sales program, terminal stocks, inbound grain, and customer requirements. In more constrained environments it is more imperative that there are tools available to continue loading in the rain. Any solution must have clearly defined costs and time to setup, otherwise there is little ability to properly assess when loading in the rain is appropriate. In this regard, there were differences in what is considered reasonable or appropriate. It is not likely that one solution exists that will work for all terminals, all the time, so it must remain at the discretion of the terminal operators when or if they need to incur additional operating costs to load during inclement weather.

- Every grain terminal plans to increase their annual throughput and believes that eventually this growth will be constrained if there is no ability to load in the rain. Agronomic practices throughout Canada are increasing crop yields to the extent that, even without increasing their market share, grain exporters expect to continue seeing growth in their volume handled. Once again, the varied configurations of grain terminals at Vancouver lead to a wide range of expectations on when rainfall will begin to restrict growth. For some terminals, the horizon is as short as the next record harvest, while other terminals are looking at 10-year plans to mitigate the impact of rainfall on vessel loading.

- The inability to continue loading during prolonged periods of rainfall can lead to terminal storage being filled to its operational capacity and necessitate stopping the unloading of railcars. This has downstream effects on railway partners, who may not have the capacity in local rail yards or nearby networks to hold trains until they can be unloaded and returned to the country. When this occurs, either the terminal will request trains held back, or the servicing railway will make the decision. Regardless of whether the delay is at the terminal's request or not, the carrier will decide which trains are held back and where they will dwell on their network. Consequently, trains are held and staged where they are optimal for the railway. When the trains are eventually released to be unloaded it may no longer be in the sequence requested by the terminal which disrupts their operating plans and elongates the time to recover from rain events.

- Rain delays can increase vessel time in port, affecting anchoragae utilization in and around the Port of Vancouver, notably near the Southern Gulf Islands. The operating policy of the Port of Vancouver is that vessels should not stay more than seven days in English Bay. Vessels which are not expected to be loading within seven days, or have stayed in English Bay beyond them, may be required to anchor at any of the 33 anchorages around the Southern Gulf Islands or the six anchorages at the Port of Nanaimo. In emergency situations with considerable port congestion there are a further five anchorages available for overflow capacity at Royal Roads near the Port of Victoria. Extended time in port also leads to increased demurrage expenses for grain shippers as ship owners reclaim the time that their vessels are in port and waiting outside the terms of the charter party agreements.

- Most grain terminals have their own systems for monitoring or quantifying the reasons for delays in ship loading, whether due to weather conditions or other sources. The level of detail collected varies with the internal processes of each terminal and did not appear relatable in a meaningful enough way to allow for a third-party, with the cooperation of terminals, to produce a quantitative analysis of the costs from rain delays. Nor was there an appetite for such a measure to be produced. The operators expressed that there would be little value added over the reports already produced by the Grain Monitor.

4.50 Impact on loading vessels

Given the intermittent nature of rainfall at Vancouver (Section 3) there could remain many hours of full productivity during a day that has inclement weather. When days are grouped by the number of hours with rainfall and compared against the amount of grain loaded by Vancouver terminals there is a clear negative correlation (Figure 21). Each additional hour of rainfall in a day predicts a reduction of 2,225 tonnes in loading throughput. Notably, this refers to the total for all grain terminals at Vancouver combined which is a comparatively small effect – between one and two hours of full loading rate for a single terminal.

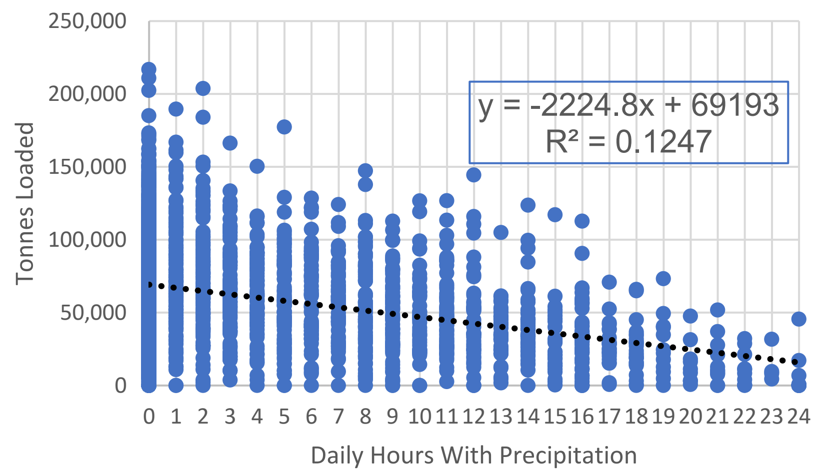


Figure 21 – Daily Tonnes Loaded onto Vessels vs Hours with Precipitation

All other factors that affect terminals' readiness to load, such as grain supply, rail service, and having the vessel at berth, among others, contribute to collectively explain the remaining 88% of fluctuations in daily loading volume.

4.60 Impact on unloading of railcars

Unloading railcars during periods of inclement weather doesn't have the same issues as loading vessels, primarily because the unloading is performed in enclosed sheds. The sheds protect the grain, keeping it dry throughout the unloading process. Rainfall, therefore, isn't expected to directly lead to a decrease in a terminal's ability to unload. Car unloading only stops when there isn't sufficient available storage capacity to receive the grain, which can occur during periods when loading to vessels is prevented. Without sufficient storage to receive incoming grain, a terminal will ask the delivering railway to defer car spotting to a later date. Additionally, if there are signs that capacity will be constrained in the coming days, a terminal operator may request that inbound trains in the country be intentionally slowed to help alleviate pressure at the port.

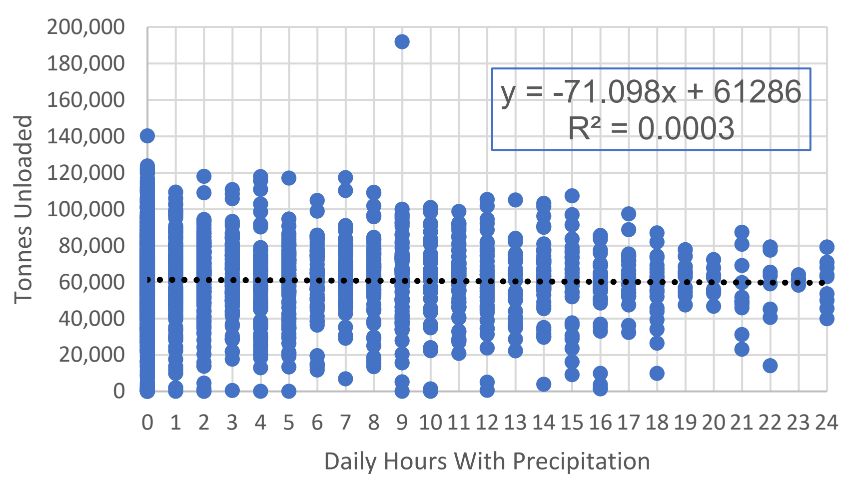


Figure 22 – Daily Tonnes Unloaded from Railcars vs Hours with Precipitation

The instances where indirect impact on unloading railcars have occurred have not been sufficient to appear in a regression over the long term (Figure 22). The number of hours in a day with rainfall has no measured impact on the tonnage unloaded from railcars. To be sure, disruptions to railcar unloading do occur as an indirect result of inclement weather, however the impact is not visible in aggregate. Rather, there are individual circumstances that must be addressed between the receiving terminal and their servicing carrier. Effective communication between terminal and railway is critical to mitigate the impact to both parties, and sufficient surge capacity in the rail network can further aid recovery from rain events.

5. Pacific Northwest

5.10 Terminals

There are eight export grain terminals operating in the US Pacific Northwest region (PNW). Two terminals in Puget Sound (Seattle and Tacoma, WA) primarily receive corn and soybeans, but also some wheat, by rail and load it to ocean vessels. Six terminals on the Columbia River (Longview, Kalama and Vancouver, WA and Portland, OR) receive wheat, corn and soybeans by rail and barge before loading it to vessels.

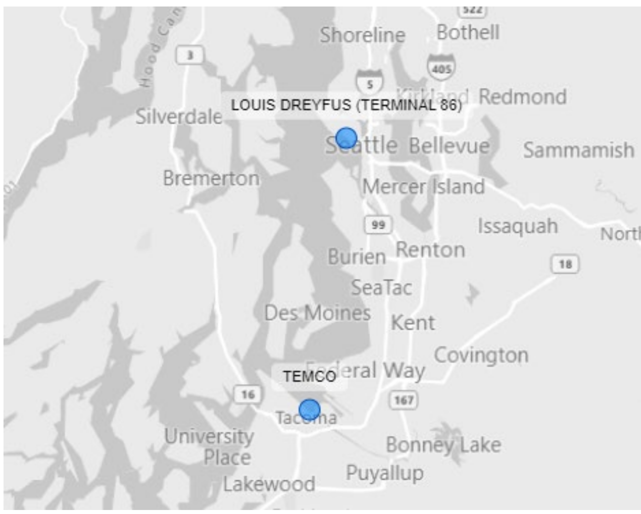


Figure 23 – Puget Sound Terminals

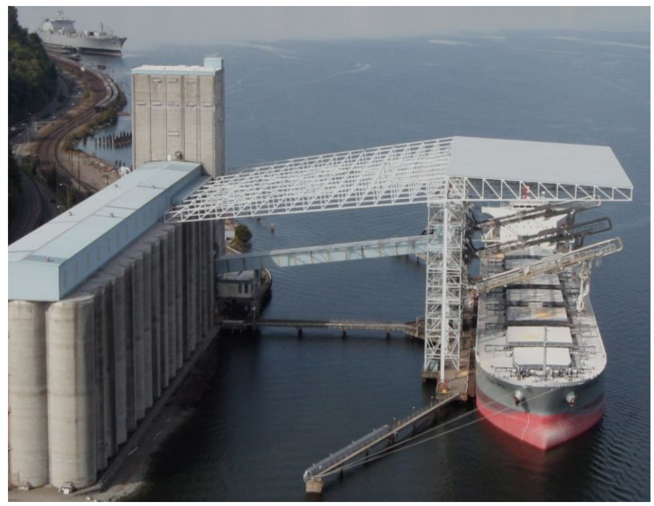


Figure 24 – TEMCO Tacoma, WA
Photo Credit: www.bluewatershipping.com

Puget Sound:

- Terminal 86 in Seattle is operated by Louis Dreyfus Corp, a subsidiary of multinational Louis Dreyfus Company which has US headquaters located in Wilton, CT.
- TEMCO Terminal in Tacoma. TEMCO is a joint venture between Cargill and CHS Grain. The TEMCO facility is distinguished as the only west coast grain terminal that operates under a covered vessel loading berth (Figure 24)

Columbia River:

- EGT is in Longview, WA and is a joint venture between global grain company Bunge and Pan Ocean, a Korean grain importer.
- TEMCO in Kalama, WA is the second of the three TEMCO terminals in the PNW.
- Kalama Export Terminal, in Kalama, WA is operated by Columbia Grain. Columbia is a joint venture of US based multinational ADM, and Japanese traders Marubeni and Mitsubishi
- Terminal 5 in Portland, OR is operated by Columbia Grain. Terminal 5 is also the location of a potash export facility, operated by Canpotex of Saskatoon, SK.
- TEMCO also has a terminal on the Willamette River in Portland, OR.

- UGC Terminal on the Columbia River in Vancouver, WA is operated by United Grain Corporation, which itself is owned by Japanese trading company Mitsui. It is the largest grain export terminal in the PNW.

Figure 25 – Kalama and Longview Terminals

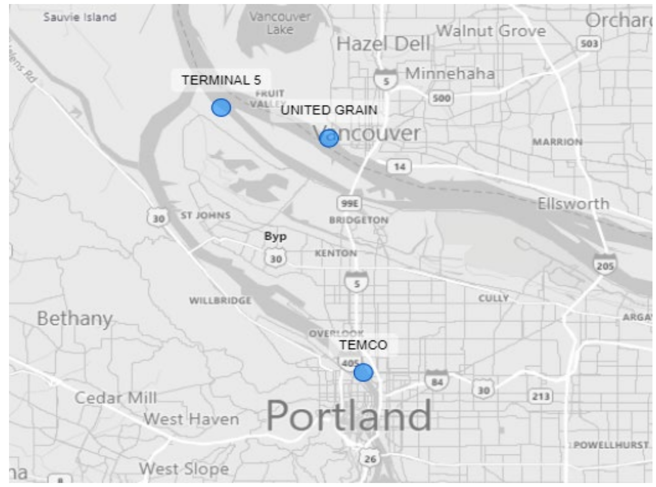


Figure 26 – Vancouver and Portland Terminals

5.20 Loading in the Rain Operational Overview

The investigating team contacted several PNW grain terminals with the intent of scheduling meetings in which we could discuss their loading-in-the-rain practices as well as issues with overall terminal operations. Following those meetings, it would then have been possible to present a fulsome comparison between the practices at Vancouver BC and within the PNW. However, responses were scant, and it soon became apparent that there was a reluctance to meet and/or discuss these practices and issues. While we will likely never be able to determine the exact reasons for their reluctance, two factors may have played a role. First, some challenging labour negotiations were underway during the period we were reaching out. Second, the Columbia River terminals may not be willing to offer any advice that could provide additional competitive advantages to nearby Canadian ports for attracting grain sales by aiding in reducing rain delays.

5.30 Terminal Tariffs

In discussions with ship owners whose fleets serve both sides of the border, we learned that one of the primary mechanisms used in the PNW to continue loading in the rain is through the application of their tariffs. Unlike in Canada, where terminals must post maximum tariffs with the Canadian Grain Commission, the US terminals publish their own tariff schedules. These tariffs may include either penalties, or demands to vacate the berth, if the ship's Master refuses to load grain when it is requested.

The ship's Master has the final say on whether or not loading will occur in all conditions, including rain. Responsibility for the condition of the grain at destination lies with the Master. The sale and vessel order will specify the maximum moisture content of the cargo, which varies by commodity but is usually about 12%. State or federal Department of Agriculture inspections monitor the quality of the cargo, not unlike the Canadian Grain Commission's role at Vancouver. A caveat is that a running total of the overall grain quality may give a false impression of how much additional moisture got into one hold, or is resting on the surface, hence the Master's concern over and above the inspections.

When a ship master refuses to load the penalties applied through terminal tariffs can be very costly, regardless of the reason for refusal. In some cases, the tariffs explicitly mention weather delays as insufficient reason to cease loading. There are penalties that range up to $15,000 USD per hour of loading delay and pass on the cost of repositioning the vessel. As an example, two terminals' tariffs[7] read as follows:

1. *Whenever [the terminal] has ordered elevator labor for operations at the terminal and through no fault or inability of [the terminal], the vessel fails to berth, fails to perform, fails to vacate the berth or causes loading operations to stop, the vessel shall be subject to the cost for the disruption of operations at the rate of $15,000 per hour or fraction thereof which shall continue until the cause of the delay has been corrected.*
2. *Any vessel, while at berth, that is unwilling or unable to load due to weather or for any other reason, shall vacate the berth at the vessel's expense when ordered to do so, or be assessed a berth delay charge as per item 34 of this Tariff, at the discretion of the Company.*
   Item No.34. Berth Delays
   In order to compensate the Company for berth disruptions and loss of business opportunity in Terminal operations, for any berth delays identified in this Tariff, a berth delay charge of $12,000 per hour or fraction thereof shall be continuously assessed on ocean vessels until the cause of the delay has been corrected.

When faced with the prospect of such substantial penalties, a ship's Master may allow loading grain in conditions that put greater risk on quality of the grain. This may result in a clause being added to the Mate's Receipt, issued by the officer responsible with notification that the cargo has been loaded, stating that the commodity was loaded during rain and the condition is therefore unknown. The Mate's Receipt is usually the basis for the Bill of Lading but has no legally binding conditions on its own.

The discussions with ship owners highlighted that once a disagreement occurs between the terminal and the Master regarding loading during inclement weather the matter can become quite complicated before resolution. The charterer may levee additional penalties against the terminal all while the terminal is applying their own for delay of loading or failure to vacate the berth. Each party is motivated to reduce their risks with documentation, such as clauses on the Mate's Receipt or Letters of Protest, though rarely will any party agree to sign a Letter of Indemnification.

6. Summary Findings

The effect that inclement weather has on grain terminal operations is not dissimilar to the effect that cold weather has on railway operations. In both instances a known and frequent weather event, rain at Vancouver or winter in the prairies, disrupts the supply chain and reduces capacity. A resilient supply chain has means to mitigate the impact of such interruptions to the regular flow of goods. There is no single fix that will eliminate the problems that weather imparts on the Canadian Grain Handling and Transportation System, but improving throughput during weather events and adding surge capacity to expediate the subsequent recovery period are key elements.

Weather

The weather patterns between the two regions are similar enough that it is reasonable to expect solutions that work in the Pacific Northwest could benefit Vancouver, BC, and vice-versa. One caveat is that the intensity of

[7] While the terminal tariffs are publicly posted, Quorum Corp. has opted to anonymize the tariff excerpts as would be done for any private discussions, such as those held with the Vancouver BC terminal operators.

rainfall was 42% higher across the report period at Vancouver BC than what was observed for Portland, OR or Seattle, WA. This is an important consideration because the intensity of rainfall during loading may reduce the quality of grain at the port of discharge. More intense rain allows more moisture to enter the hold or to rest atop the surface of the last grain loaded when hatches are open. The lower intensity rainfall typical of the PNW may allow for more opportunities to load with minimal risk to quality than would be present in BC. Even within the Port of Vancouver there could be meaningful differences in precipitation received at terminals on the north-shore, south-shore, or on the Fraser River.

If a remedy that blocks water from entering the hold is used, such as with feeder holes, the intensity of rainfall is no longer an important factor as it should be water-tight regardless of intensity. A solution that works during heavy rainfall would be equally applicable to each region in terms of technical application, if not also procedurally.

Diverse Vancouver Terminal Configurations

No two grain terminals at the Port of Vancouver have identical vessel loading configurations. Each have different layouts, loading spouts, rail receiving track, storage capacity, sales programs, tidal and berth window restrictions - to name a few. These varied configurations make it so that terminals, faced with the same weather conditions, can make completely different decisions regarding whether loading in the rain is prudent or not. A single solution, such as currently exists with feeder holes, is not likely to be sufficient for all terminals. Loading through feeder holes is often done at some terminals, seldom at others, or never at all. The procedure just works better for certain terminal setups than others.

Any new procedures developed that allow for loading during inclement weather are very likely to also work more favourably for some terminals over others. Terminal operators did not express concern over that fact, nor did they consider it a reason not to seek solutions. Rather it is recognition that it is important to have options, and critically, that the decision to mobilize any of the options rests solely with terminal management.

Early feedback from those involved in the working groups tasked with exploring new solutions to allow for loading in the rain indicate that this is well understood. Multiple projects are underway simultaneously that would, if successful, provide more options for terminals to decide which remedy is appropriate at which times.

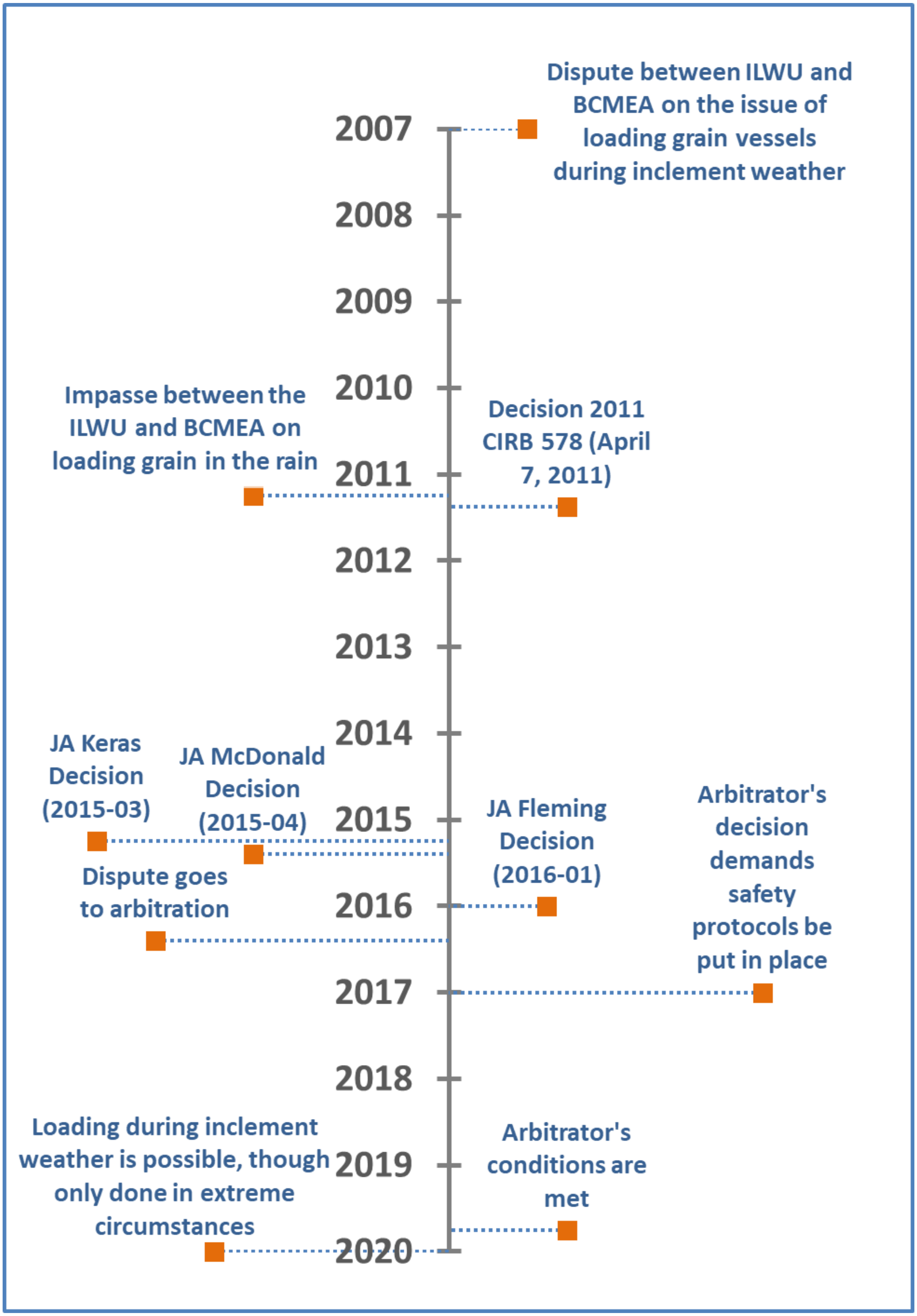
Pacific Northwest Remedies

While not every terminal employs this approach, most Puget Sound and Columbia River terminals have some form of penalty for not loading which can be applied to the vessel. Canadian terminals have no such provision in their posted tariffs and are unable or unlikely to pass down other costs to the vessel such as pilotage fees when forcing a vessel off berth.

This may be the largest difference between the operating policies and regulatory frameworks of Canada and USA as it relates to loading in the rain. The PNW terminals have the freedom to set their own tariff schedules and they have used it to incentivize, or pressure, ship masters to continue loading in conditions that may risk the quality of the cargo. Under the exact same conditions at the Port of Vancouver, it is believed that no loading would be occurring as all terminal managers reiterated that the slightest amount of rainfall had master's calling for loading to cease.

The Canadian grain industry enjoys a global reputation for high standards of grain quality and delivers its product to these standards. It is unlikely any Canadian grain exporter will move to deviate from those standards and will continue to endeavour to find appropriate solutions that reduce or eliminate the risks of product degradation due to rain entering a vessel's hold during loading.

Appendix A Dispute Timeline



Appendix B Weather Data Sources

Weather Analysis Period

The period examined covers seven full years, from January 1, 2015 through December 31, 2022 excluding all of 2020. The start date was determined by data availability at the best situated station for the harbour at Longview WA, which did not have sufficient precipitation values until 2015.

2020 is excluded from the period because all Environment and Climate Change Canada monitoring stations at or near the Vancouver Harbour experienced an issue between January and April 2020 that caused significant hourly and daily records to not get recorded. The four months without data have historically accounted for 35-50% of total annual precipitation, so the values for 2020 would be underreported were the remaining months of the year still included.

All weather analysis uses this period, even for stations which had 2020 data supplied.

Sources

Canada Climate Data Source

Historic weather for Canadian cities is provided by Environment and Climate Change Canada (https://climate.weather.gc.ca).

Hourly precipitation values are not available for all stations which limits the regions included in some measures.

USA Climate Data Source

Historic weather for US cities is from dataset NCEI DSI 3505 provided by National Centers for Environmental Information (www.ncei.noaa.gov).

Hourly precipitation values are not available for all stations which limits the regions included in some measures.

Global Climate Data Source

Global 30-year averages are provided by https://en.climate-data.org/ using the period of 1991-2021. Details about their data sources are available at https://en.climate-data.org/info/sources/.