Analysis of the Impact on Washington State Exports
from a Potential Public Utility Tax Applied by the State of Washington

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Executive Summary

This report provides an analysis of the impact on Washington waterborne export volumes arising from a potential public utility tax (PUT) applied by the State of Washington. This tax would be applied to freight transportation shipments in the State in the amount of 1.926% of the freight charges. For interstate shipments, a portion of the freight charge, in proportion to the mileage within Washington divided by the overall mileage, would be assessed the tax.

To assess the impact, the author analyzed Freight Analysis Framework 5 (FAF5) data on waterborne exports in calendar 2019. Calendar 2019 data was selected for analysis to avoid making conclusions based on transportation flows distorted by the pandemic 2019-2022. While the FAF5 totals for export tonnages by commodity groups seem accurate, the reported shares by origin state and by domestic mode are very wrong for commodities shipped in bulk unit trains or barges, especially grain. For commodity groups not shipped in bulk, origin and model shares seem reasonably accurate. Unfortunately, bulk exports by tonnage from Washington ports dwarf containerized exports.

The consultant compared data from the Northwest Seaport Alliance (NWSA) ports on containerized exports to the FAF5 totals to estimate bulk and break-bulk tonnages by commodity group. The consultant then researched data sources in order to estimate the origin mix and domestic mode mix for bulk shipments of cereal grains (principally grain and corn), other agricultural products (principally soybeans), and other prepared foodstuffs (principally soybean meal). For these commodities, the consultant made estimates of PUT assessments on shipments from relevant, representative origins and then judgments as to the likelihood of diversion of grain, oil seeds and prepared foodstuffs to sales in markets other than export from Pacific Northwest terminals, were the PUT to be imposed.

Rail rates to Portland grain export terminals and Washington grain export terminals are equalized, reflecting a long-standing policy of showing no favoritism towards any grain trading organization. The consultant believes the railroads will continue this equalization policy in the face of an assessed PUT. Thus diversion of grain or other agricultural bulk exports from Washington ports to the Port of Portland is not a concern. Exports of these commodities originating in Washington or Oregon have no economic alternative to use of PNW ports, so no

diversion is anticipated. Moving east, shippers have increasing options for marketing their agricultural products economically in other markets, and so the risk of diversion as a result of the PUT grows.

It should be recognized that market prices for various agricultural products in various geographies fluctuate as a result of a host of factors: local and global harvest sizes, changing perceptions of future grain trading prices, fluctuations in transportation rates, military conflicts in competing supply regions, new tariffs or political tensions affecting trade opportunities, weather-related disruptions to transportation systems and ports, etc. The diversion estimates developed by the consultant are smaller than the year-to-year fluctuations in export volumes caused by the foregoing factors.

In aggregate, the consultant estimates that imposition of the Washington PUT would diminish exports of grain, including wheat, corn and soybeans from Columbia River and Puget Sound bulk export facilities, by 1.1 million metric tons, or 2.7%.

For containerized exports, a similar pattern applies: Only shipments originating outside the Pacific Northwest and Northern Plains states are susceptible to diversion from the potential PUT. While the Port of Portland offers container service, it is limited to one vessel call per week by one ocean carrier, and the relatively shallow channel depth necessitates the use of smaller, older container ships. Direct service is very limited; most destinations require the time and expense of trans-loading to other vessels. Portland is thus a niche container port, attracting only locally-generated exports with low time sensitivity. In the consultant's opinion, imposition of the PUT is unlikely to generate diversion of NWSA containerized exports to Portland.

For exports originating further east, routing via the California or British Columbia ports is conceivable. Partially offsetting the impact of the PUT, the NWSA ports enjoy a cost and transit time advantage to East Asian markets compared to California ports for some origin areas, and transit time is more important for certain containerized cargoes than it is for bulk exports. Penetration of the US – East Asia export market by the British Columbia ports is limited by the extra trucking distance and the limited US coverage of the Canadian railroads. The consultant estimates 4,300 TEUs or 0.5% of containerized exports via the NWSA ports would be diverted were the PUT to be imposed.

The consultant also studied exports in breakbulk vessels from Washington. Exports from Pacific Northwest states would be unaffected by the potential PUT. Breakbulk shipping of exports originating in Midwestern states is mostly agricultural or construction equipment shipped in chartered vessels, for which routing via California or British Columbia ports would add significant time and cost. For these reasons, the consultant estimates no diversion of breakbulk exports would result from imposition of the Washington PUT.

The diversion estimates herein are the professional judgments of the consultant, as there is not enough data available to analytically compute diversions. While the consultant's estimates of diversion of containerized exports are informed by knowledge of rate differentials to alternate ports as delineated in the report, it is difficult to know exporters' trade-offs of extra transit time vs. reduced shipping cost without knowing the particulars of sales terms of each exporter. The

transit time differential shrinks as origins move further east and south; hence the estimates reflect increasing probability of diversion for origins further east and south. Exports of bulk grain are hardest to predict because (1) grain producers are not committed to any end market, import or export, and (2) decisions are made about where to market grain based on perceived end-market price less transportation costs, considering all alternative end markets. An analytical approach would require data on transportation costs and market prices for Gulf export terminals as well as transportation costs and market prices for domestic uses and destinations of grains (feedlots, flour mills, etc.). What is clear is that as origins move further east and south from Washington, other markets and other export terminals become more and more competitive, and so the consultant has structured his estimates accordingly.

Consultant Background and Methodology

I will begin this report with a summary of my professional background and academic training, highlight my experience in analyses to predict international container volumes by port, and then present the specific analysis of the potential tax.

I received the AB degree in Mathematics and Physics in 1973, the MS degree in Operations Research in 1975, and the PhD degree in Industrial Engineering and Operations Research in 1979, all from the University of California at Berkeley. During semester breaks and summers in 1970, 1971, 1972 and 1975, I worked various positions in the Operating Department of the Oregon Division of the Union Pacific Railroad. During the years 1973 and 1974 I worked as a Service Planning Analyst in the Marketing Department of Union Pacific Railroad. During the period 1977 – 1982 I worked as a Planning Engineer, Senior Engineer and an Associate Engineer for Alan M. Voorhees & Associates, later PRC Planning & Economics, a nationally-recognized transportation planning firm. Beginning in 1979 I joined the faculty of the Dept. of Industrial Engineering and Operations Research at the University of California at Berkeley, rising to the rank of Full Professor in 1992, a position I now hold. In 1983 I founded Leachman & Associates, and I continue to serve as Principal for this limited liability company (LLC). Leachman & Associates provides consulting and software for the management and design of supply chains and for economic and capacity analysis of freight transportation.

Since 2003 I have directed the development and application in policy analysis of a large-scale economic model embracing all waterborne containerized imports from Far Eastern countries to the Continental United States. The model computes optimal supply chain strategies for each of the 90 largest importers of Far Eastern goods to the USA, plus optimal supply chain strategies for each of 16 generic importers serving as proxies for all other small and regional importers. The import volumes for these generic importers are calibrated such that there is a match between the total commodity volumes and the distribution of declared values in U S Customs data on such imports and those in the model. For this purpose, Port Import-Export Reporting Services – Trade Intelligencer (PIERS-TI) and Global Trade Atlas (GTA)[1] summaries of US Customs transactions on waterborne, containerized imports from the Far East to the United States for

[1] PIERS-TI and GTA are commercial data service products of IHS Markit.

calendar 2005, 2015 and 2019 were secured by the author. The supply chains are optimized by the model in the sense of providing the lowest total logistics costs including all costs for transportation and handling plus holding costs for pipeline inventories and destination safety-stock inventories of the imported goods. The model is calibrated with PIERS-TI and GTA data concerning declared values for Far Eastern imports stratified into 99 commodity types and import volumes for the 106 importers; US Census data on purchasing power by State and County; rate quotations and confidential contract rates from ocean carriers, intermodal marketing companies, and third party logistics providers for large and small importers; and statistics concerning container flow times by port and landside transportation channels. Destinations included in the model are 22 popular sites for regional distribution centers across the Continental USA. The import volume to each site is assumed to be proportional to the fraction of total Continental USA purchasing power within the region served by the site. Supply-chain volumes from all importers calculated by the model are aggregated to predict import volumes by port and landside transportation channel for each of 13 potential North American ports of entry, including the Ports of Seattle and Tacoma, and the 22 destination regions (e.g., the region local to the Puget Sound ports includes Washington, Oregon, Idaho and Montana). This model is known as the Elasticity Model because repeated calculations of the model may be used to assess the impact of potential changes in transportation rates or port fees in terms of shifts in import volumes by port or channel. The methodology underlying the Model has been published in the academic journal *Transportation Research*.[2] In recognition of this research, I served as an Associate Editor of the journal.

Overseas Waterborne Exports

The principal data source on export volumes for this analysis is the Freight Analysis Framework 5 (FAF5) database for calendar 2019. FAF5 provides data on exports of 43 commodity groups (SCTG codes) concerning annual tonnage broken out by SCTG code, origin state, export state/region, domestic transport mode, and export transport mode. Export regions within Washington State include Tacoma – Seattle and Grays Harbor, Portland area within Washington State (Vancouver, Kalama and Longview), and Other Washington (principally the oil refineries at Anacortes, Ferndale and Cherry Point, the Naval Supply Center at Everett, Port Angeles forest product export terminals, and the Blaine crossings for truck and rail exports to Canada).

Total export tonnages by commodity group reported in FAF5 seem accurate. However, the reported origin and modal mix of commodity groups with significant amounts of domestic transportation via barge or unit train are sometimes very wrong in the FAF5 data. As will be discussed, for coal, cereal grains, agricultural products and prepared foodstuffs, the origin and mode data reported by FAF5 is poor. This is quite important to Washington State, because on a tonnage basis, these commodities account for a substantial share of State exports. Other data sources or assumptions were relied upon by the consultant to do the analysis for these commodity groups.

[2] See Leachman, Robert C., 2008. "Port and Modal Allocation of Waterborne Containerized Imports from Asia to the United States," *Transportation Research Part E*, **44** (2), p. 313 – 331 (March, 2008).

Excluding exports to Canada, the 2019 waterborne export tonnages from Washington State by commodity group reported by FAF5 are summarized in Table 1.

Table 1
2019 Waterborne Export Volumes (Tonnage) from Washington State Ports
(Excluding Exports to Canada)

Commodity Group	SCTG Code	Tonnage exported via Columbia River ports in WA (1000s of metric tons)	Tonnage exported via Grays Harbor and Puget Sound ports (1000s of metric tons)	Tonnage exported via WA ports north and west of Seattle (1000s of metric tons)
Animals, fish	01	1.9	-	-
Cereal grains	02	13,747.5	1,419.4	-
Ag products	03	12,205.3	7,178.8	69.2
Animal feed	04	16.0	1,159.9	40.1
Meat, seafood	05	-	1,172.5	19.3
Milled grains	06	-	89.9	-
Other foodstuffs	07	3.2	1,950.3	233.6
Alcoholic beverages	08	-	28.4	-
Gravel	12	-	1.1	-
Nonmetallic minerals	13	13.3	30.7	-
Metallic ores	14	214.1	88.6	-
Coal	15	-	65.0	-
Gasoline, ethanol	17	-	691.8	142.8
Fuel oils	18	-	1,304.3	398.5
LNG, propane, asphalt	19	564.3	33.4	801.9
Basic chemicals	20	43.9	168.5	-
Pharmaceuticals	21	-	10.7	-
Fertilizers	22	-	3.7	-
Chemical products	23	-	120.8	-
Plastics & rubber goods	24	-	64.8	-
Logs	25	1,542.3	375.0	175.7
Wood products	26	1.7	610.8	-
Newsprint, paper	27	38.1	1,687.9	-
Paper articles	28	-	118.8	-
Printed products	29	-	16.2	-
Textiles, leather	30	-	52.4	-
Nonmetallic minerals	31	-	197.1	-

Base metals	32	-	78.2	2.6
Articles of base metal	33	-	43.5	-
Machinery	34	3.6	1,324.1	13.3
Electronics	35	-	231.5	-
Motor Vehicles	36	-	240.9	-
Transportation eqpt.	37	-	249.8	-
Precision instruments	38	-	142.8	-
Furniture	39	-	41.6	-
Misc. mfg. goods	40	-	140.0	-
Waste, scrap	41	123.8	806.5	1.9
Mixed freight	43	-	478.7	-
Totals		28,541.7	23,876.5	2,794.6

Source: Freight Analysis Framework 5 data. Commodity groups with annual volumes less than 1,000 tons are ignored.

The coal volume shown in red in Table 1 is believed to be erroneous; this volume actually moved by rail through Washington intact to the Roberts Bank terminal in British Columbia for trans-load to water shipment from Roberts Bank to East Asia, as discussed below.

Waterborne exports from Washington take four basic forms: (1) Containerized through the Northwest Seaport Alliance (NWSA) ports or the Naval Supply Center near Everett; (2) Ro-Ro (Roll-on, roll-off) vessels for hauling motor vehicles; (3) Bulk vessels for hauling logs, wood pulp, grain, soybeans, or soybean meal; and (4) Breakbulk vessels hauling machinery, paperboard, and other commodities. 2019 containerized exports from the NWSA ports of commodity groups ranked by volume are summarized in Table 2.

Table 2
2019 Containerized Exports from the NWSA Ports

Commodity Group	**SCTG Code**	**TEUs**	**Est. Tonnage (1000s of metric tons)**	**Percent of total NWSA export volume**	**Declared value**	**Percent of total NWSA export value**
Oil seeds	03	203,489	2,035	22%	$2.5B	16%
Vegetables	03	51,419	386	6%	$0.5B	3%
Fruits	03	30,480	229	3%	$0.7B	4%
Subtotal, Ag products	**03**	**285,388**	**2,854**	**31%**	**$3.7B**	**23%**
Prepared foodstuffs	07	132,617	1,326	15%	$1.9B	12%
Dairy products	07	21,226	212	2%	$0.6B	4%
Subtotal, Foodstuffs	**07**	**153,843**	**1,538**	**17%**	**$2.5B**	**16%**
Wood pulp	27	78,222	782	9%	$0.4B	3%
Paperboard	27	40,073	401	4%	$0.6B	4%

Subtotal, Pulp & paper	**27**	**118,095**	**1,181**	**13%**	**$1,0B**	**7%**
Wood products	**26**	**50,237**	**502**	**6%**	**$0.4B**	**3%**
Base metals	**32**	**31,750**	**318**	**3%**	**$0.8B**	**5%**
Cereal grains	**02**	**28,160**	**282**	**3%**	**$0.6B**	**4%**
Machinery	**34**	**19,538**	**195**	**2%**	**$1.6B**	**11%**
Plastics & rubber goods	**24**	**18,178**	**65**	**2%**	**$0..2B**	**1%**
Meat	05	15,872	159	2%	$0.6B	4%
Seafood	05	11,457	115	1%	$0.6B	4%
Subtotal, Meat/seafood	**05**	**27,329**	**273**	**3%**	**$1.2B**	**8%**
Mineral products	**31**	**13,700**	**137**	**2%**	**$0.6B**	**4%**
Textiles	30	12,470	62	1%		< 1%
Hides, skins, leather	30	9,547	48	1%		< 1%
Subtotal, Textiles and leather	**30**	**22,017**	**110**	**2%**		**< 1%**
Motor vehicles and transportation eqpt	**36-37**	**10,641**	**80**	**1%**	**$0.6B**	**4%**
Toys	**40**	**8,262**	**62**	**1%**		**< 1%**
Inorganic chemicals	**20**	**7,243**	**72**	**1%**	**$0.4B**	**3%**
All other		**113,305**	**850**	**12%**	**$1.7B**	**11%**
Total		**907,886**	**8,317**	**100%**	**$15.6B**	**100%**

Source: NWSA web site.

Tonnage estimates appearing in the fourth column are made by the author, assuming 10 metric tons per TEU for Oil seeds, Prepared foodstuffs, Base metals, Cereal grains. Dairy products, Wood products, Pulp & paper, Machinery, Mineral products, and Inorganic chemicals, 3.565 tons per TEU for Plastics & rubber goods, 5.0 tons per TEU for Textiles, and 7.5 metric tons per TEU for other commodity groups.

Excluding a minor volume exported by the Naval Supply Center near Everett, all containerized exports from Washington departed from the NWSA ports.

To estimate Washington bulk and breakbulk export volumes, a comparison of the FAF5 data and the NWSA data was made by the consultant, as documented in Table 3.

Table 3
Comparison of FAF5 and NWSA 2019 Waterborne Exports
(Excluding Exports to Canada)

SCTG Code	Commod. Group	Columbia River Ports Tonnage (FAF5 1000s of metric tons)	Seattle – Tacoma – Grays Harbor Tonnage (FAF5 1000s of metric tons)	Other WA Ports Tonnage (FAF5 1000s of metric tons)	NWSA TEUs	NWSA Est. Tons (1000s of metric tons)	Est. Bulk & Breakbulk Tons – Seattle – Tacoma – Grays Harbor (1000s)	Est. Bulk & Breakbulk Tons – All WA Ports (1000s)

01	Live animals, fish	1.9						1.9
02	**Cereal grains**	**13,747.5**	**1,419.4**		**28,160**	**282.2**	**1,137.2**	**14,884.7**
03	**Ag. products**	**12,205.3**	**7,178.8**	**69.2**	**285,388**	**2,853.9**	**4,324.9**	**16,599.4**
04	**Animal feeds**	**16.0**	**1,159.9**	**40.1**			**1,159.9**	**1,216.0**
05	**Meat & seafood**		**1,172.5**	**19.3**	**27,329**	**273.3**	**899.2**	**918.5**
06	Milled grains		89.9					
07	**Prepared Foodstuffs**	**3.2**	**1,950.3**	**233.6**	**153,843**	**1,538.4**	**411.9**	**648.7**
08	Alcoholic beverages		28.4					
12	Gravel		1.1					
13	Nonmetallic minerals	**13.3**	**30.7**				**30.7**	**44.0**
14	**Metallic ores**	**214.1**	**88.6**				**88.6**	**302.7**
15	Coal		**65.0**					
17	**Gasoline**		**691.8**	**142.8**			**691.8**	**834.6**
18	**Fuel Oils**		**1,304.3**	**398.5**			**1,304.3**	**1,702.8**
19	**LNG, ethanol**	**564.3**	**33.4**	**801.9**			**33.4**	**1,399.6**
20	**Basic chemicals**	**43.9**	**168.5**		**7,243**	**72.4**	**96.1**	**140.0**
21	Pharma-cueticals		10.7					
22	Fertilizers		3.7					
23	Chemical products		120.8					
24	Plastics & rubber goods		64.8		18,178	64.8		
25	**Logs**	**1,542.3**	**375.0**	**175.7**			**375.0**	**2,093.0**
26	**Wood products**	**1.7**	**610.8**		**50,237**	**502.4**	**108.4**	**110.1**
27	**Pulp & paper**	**38.1**	**1,687.9**		**118,095**	**1,181.0**	**506.9**	**545.0**
28	Paper articles		118.8					
29	Printed products		16.2					
30	Textiles, hides and leather		52.4		22,017	110.0		
31	**Mineral products**		**197.1**	**3.3**	**13,700**	**137.0**	**60.1**	**63.4**
32	Base metals		78.2	2.6	31,750	317.5		
33	Articles of base metals		43.5					

34	**Machinery**	**3.6**	**1,324.1**	**13.3**	**19,538**	**195.4**	**1,128.7**	**1,145.6**
35	Electronics		231.5					
36-37	**Subtotal, Motor vehicles and transpn. eqpt.**		**490.7**	**2.2**	**10,641**	**79.8**	**410.9**	**413.1**
38	Precision instruments		142.8					
39	Furniture		41.6					
40	Misc. Mfg. Goods		140.0		8,262	82.6		
41	**Waste, scrap**	**123.8**	**806.5**	**1.9**			**161.3**	**287.0**
43	Mixed freight		478.7					
	All other				113,505	851.3		
	Totals	**28,519.0**	**22,353.4**	**1,904.4**	**907,886**	**8,542.0**	**12,929.3**	**42,498.8**

Source: Data from Tables 1 and 2.

Commodity groups with significant tonnages of non-containerized exports are highlighted in bold in Table 3. Assuming the FAF5 data on total tonnages exported by commodity group are correct, out of 53 million metric tons of waterborne exports (excluding waterborne exports to Canada) from Washington in 2019, about 43 million metric tons of exports were made in Ro-Ro, bulk or breakbulk vessels, or about 81%. This compares with about 8.5 million metric tons of containerized exports (9%).

In terms of estimated Ro-Ro, bulk or breakbulk export tonnages, the fourteen largest commodity groups are as follows:

- Agricultural products (SCTG 03), 16.6 million metric tons (mostly soybeans)

- Cereal grains (SCTG 02), 14.9 million metric tons (mostly wheat and corn)

- Logs (SCTG 25), 2.0 million metric tons (mostly from Weyerhaeuser at Longview)

- Animal feeds (SCTG 04), 1.2 million metric tons (mostly DDGS[3])

- Fuel oils (SCTG 18), 1.7 million metric tons (mostly from the refineries at Cherry Point, Anacortes, Ferndale and Tacoma)

- LNG, ethanol, petroleum coke (SCTG 19), 1.4 million metric tons

- Machinery (SCTG 34), 1.1 million metric tons (mostly farm machinery)

- Meat and seafood (SCTG 05), 0.9 million metric tons

[3] Distiller's dried grains with solubles (DDGS) are a co-product of ethanol refining and are sold as animal feed. DDGS move in rail carloads from Midwestern ethanol plants to Washington grain export terminals.

- Gasoline (SCTG 19), 0.8 million metric tons (mostly from the refineries at Cherry Point, Anacortes, Ferndale and Tacoma)

- Prepared foodstuffs (SCTG 07), 0.6 million metric tons (mostly soybean meal)

- Pulp and paper (SCTG 27), 0.5 million metric tons

- Motor vehicles and transportation equipment (SCTG 36), 0.4 million metric tons

- Metallic ores, 0.3 million metric tons

- Waste and scrap, 0.3 million metric tons

The economics of diversion of containerized and non-containerized exports are different and so are treated separately in the following.

Potential Diversion of Bulk and Break-Bulk Exports

Coal

Considering all modes, for coal (SCTG 15) exported from Washington in 2019, FAF5 shows the following:

- Multiple modes & mail domestic transport from Montana to Washington, multiple modes & mail export transport from Washington: 1,924,300 tons

- Multiple modes & mail transport from Wyoming to Washington, multiple modes & mail export transport from Washington: 6,500 tons

- Rail transport from Utah to Washington, water export transport from Washington: 52,600 tons

- Rail transport from North Dakota to Washington, water export transport from Washington: 1,700 tons

- Truck transport from North Dakota to Washington, water export transport from Washington: 9,000 tons

- Coal total: 1,994,100 tons

The consultant believes that in reality, export coal arrived in Washington entirely by unit train. None of the coal exported from Washington came from Utah or North Dakota; all of it came from Montana and Wyoming. None of the coal exported from Washington was via "multiple modes & mail" or via water; in reality, it all moved in and out of Washington by rail unit train, passing through the Blaine gateway to the Roberts Bank terminal in British Columbia, where it was trans-loaded into vessels for export overseas. The total tonnage reported by FAF5 is equivalent to about 110 18,000-ton trainloads, or about one train every three days. The reported total volume seems accurate, but the break-outs by mode and origin are not plausible.

Because this volume was exported to Canada via rail, technically it is outside the scope of the consultant's effort. Notwithstanding the modal error, the consultant's opinion about the impact of the potential PUT on coal traffic follows.

Export of coal has few alternative ports on the West Coast. Environmental interests have defeated all efforts to develop coal export terminals in Washington and Oregon. Efforts to develop new terminals in California also have been defeated. At present, California only has three terminals trans-loading unit coal-train shipments of coal to ocean-going vessels. In Richmond, California, on San Francisco Bay, a relatively small coal export facility during 2019 handled a unit train of export coal from Utah arriving once every three days (and it continues to do so). The facility does not have capacity to handle much more. Another facility in Stockton handled about the same amount of Utah export coal in 2019; it also has little excess capacity. A bulk export facility in Long Beach handled, on average, about one coal train every 5 days in 2019; that facility also handles export of other bulk commodities and so has little or no excess capacity. From Powder River Basin mines in Wyoming or mines in Montana, rail shipment costs to the California ports are much higher than costs to Roberts Bank, so California ports do not present an economic alternative. While it is theoretically possible to route coal trains from these origins via interchange to the Canadian Pacific railroad, the consultant believes BNSF would not agree to such a routing sharply diminishing its revenues.

In the consultant's opinion, the Wyoming and Montana interests exporting coal via Roberts Bank have no economic alternative but to route unit trains through Washington State. The proposed PUT would have little or no effect on their preference for Roberts Bank over other ports accommodating coal exports, albeit their profit margins and/or competitiveness in Asian markets could be eroded.

Machinery

The 2019 non-containerized machinery exports were mostly agricultural or construction equipment produced in the Midwestern states, trucked or moved by rail to Washington, then shipped in breakbulk vessels to Asian countries. Major origins for his traffic included agricultural and construction equipment manufacturers in Illinois, Iowa and Minnesota. Most or all of this breakbulk export tonnage moved in chartered vessels. The cost of chartering vessels bound for Far East destinations from California ports is much more expensive than from Washington ports, and the transit time is 2-4 days longer than from Washington ports. In the consultant's opinion, these exports are insensitive to the potential PUT.

Motor Vehicles

The strong majority of motor vehicles exported from Washington were not exported in containerized form. They were produced in Midwestern states, arrived Washington in dedicated trains, and departed Washington in Ro-Ro vessels. In particular, Stellantis North America (Chrysler, Jeep, Fiat) exported vehicles assembled in Michigan, Ohio and Illinois and destined to Far East markets using the Ro-Ro terminal at Grays Harbor. Other makes could have been exported from the Port of Tacoma, which handled 162,484 vehicles (counting both imports and exports) in 2021. However, the consultant believes the reported Port of Tacoma volume is entirely or almost entirely imports.

While Ro-Ro service is available to the Far East from California ports, it is significantly more expensive and transit times are 2-4 days longer. In the consultant's opinion, in the face of the

potential PUT, California ports do not offer an economic alternative to Washington ports for motor vehicle exports to the Far East.

The Port of Portland includes two Ro-Ro terminals for imports and exports of motor vehicles at Terminal 6. A third Ro-Ro terminal at Terminal 4 is utilized exclusively by Toyota. The Port handled almost 245,000 vehicles in 2022, and asserts that it is the largest auto export terminal on the West Coast. The Port has surplus capacity and could absorb most or all of the Washington export volume.

The Stellantis vehicles come to Grays Harbor in dedicated Union Pacific trains which travel only 136 miles within Washington State out of a 2,400-mile or longer haul from Midwestern assembly plants.[4] The rail rates for vehicles from Midwestern assembly plants to Washington ports are unknown to the consultant but thought to be on the order of $6,000 per carload, where one multi-level rail car holds fifteen sedans (tri-level rail car) or ten SUVs or pick-up trucks (bi-level rail car). Assuming that carload rate, the potential PUV would amount to between $0.43 (sedan) and $0.66 (SUV) per vehicle.

The consultant believes the Grays Harbor interests would be reluctant to lose the auto export business and would strive to price to be competitive with Portland for the export auto traffic. In the consultant's opinion, the Stellantis traffic would remain at Grays Harbor in the face of the modest potential PUT. Were the PUT to rise to more than a dollar per vehicle, the risk of diversion to the Port or Portland could become serious.

Pulp and Paper

According to FAF5, all but 61,000 metric tons of the Washington pulp and paper exports originated in the Pacific Northwest states, with 1.381 million metric tons originating in Washington, 167,000 metric tons originating in Oregon, and 117,000 metric tons originating in Idaho. All of the export tonnage not originating in the Pacific Northwest is believed to be containerized and is discussed in a separate section below. Washington pulp and paper exports, if routed to ports outside Washington, would experience no reduction in PUT and are therefore insensitive to it.

Some of the Oregon-originated and some of the Idaho-originated export tonnage of pulp and paper also is containerized. Containerized exports of pulp and paper from Oregon and Idaho could avoid the PUT if exported via the Port of Portland. However, container vessel service from Portland at present is limited to one vessel call per week provided by one ocean carrier using a relatively small container ship respecting the 43-foor channel depth of the Columbia River. Many destinations are infeasible to reach without incurring the expense of intermediate handling.

The FAF5 data shows that for Washington pulp and paper exports originating in Oregon, 26,000 tons arrived at Columbia River ports by truck and 8,000 tons arrived by rail. These are break-bulk exports, mostly or entirely from the Weyerhaeuser terminal in Longview. Truck shipments could follow US highway 26 up the Oregon side of the Columbia River, then cross the Longview

[4] The last 53 miles from Centralia is via the short line Puget Sound and Pacific. Union Pacific pays PS&P a per-car rate to handle its vehicle and grain trains to and from Grays Harbor. BNSF has similar arrangements with PS&P.

Bridge, thereby trivializing the mileage subject to the PUT. The rail shipments likely involved either Weyerhaeuser-produced pulp and paper or pulp and paper Weyerhaeuser purchased from other Oregon producers. Use of an Oregon export facility instead of its own facility in Longview would entail a greater expense for Weyerhaeuser than the assessed PUT.

In the consultant's opinion, diversion of break-bulk exports of pulp and paper as a result of the PUT would be negligible, if any.

Meat and Seafood

About 609,000 metric tons of the 1.2 million metric tons of meat and seafood exported from Washington ports in 2019 originated in Washington state. Another 207,000 metric tons originated in Alaska, Oregon, Idaho or the Northern Plains states. Diversion of these exports to other ports would entail an increase in transportation costs much greater than the PUT or an increase in Washington mileage and hence an increase in the assessed PUT. No diversions of such exports would occur. This leaves about 304,000 metric tons of this commodity group originating in other states for which other West Coast ports could be competitive. Exports from other states are believed to be all containerized. Potential diversion of containerized exports is treated in a separate section below.

Agricultural Commodities in FAF5

While some of the 2019 soybean, grain (principally wheat and corn), animal feed, and soybean meal bulk exports originated in Washington, most originated outside the Pacific Northwest and arrived at Washington export terminals in unit trains. Some volumes of these commodities originating in Montana and the Pacific Northwest states arrived at Columbia River export terminals via barge or truck. Each of these commodities is treated separately in the following.

In the case of cereal grains (SCTG 02, including wheat, corn, rye, barley, oats, sorghum, rice) exported from Washington in 2019, FAF5 data shows the following (including all modes for domestic transport):

- Originating in Northeast states: 228,400 tons (including 196,000 tons originating in New Jersey)

- Originating in Southeast states: 170,100 tons (including 163,200 tons originating in Louisiana)

- Originating in Southwest states or California: 184,400 tons (including 166,000 tons trucked from California to Canada)

- Originating in Midwest states: 211,500 tons (including 113,500 tons from Illinois, 35,800 tons from Minnesota, but only 660 tons from Iowa)

- Originating in Northern Plains states (ND, SD, MT): 135,200 tons

- Originating in Idaho: 3,300 tons

- Originating in Oregon: 209,200 tons

- Originating in Washington: 14,421,200 tons

- Cereal grains total: 15,563,300 tons

While the total export tonnage reported by FAF5 is plausible, the geographical mix of origins is clearly way off. In reality, no large amount of grain moved from New Jersey to export in Washington. Much of the huge tonnage reported as originating in Washington actually originated in the Northern Plains states and Idaho. Some of this is because some Idaho and Montana grain was trucked to a barge terminal at the head of Snake River navigation at Clarkston, WA. But much more tonnage originating further east and arriving in Washington by unit train for some reason is shown in FAF5 as having originated in Washington. Different data sources or assumptions concerning shipment origins must be utilized to study the impact of a PUT on export of cereal grains.

In the case of agricultural products (SCTG 03, including vegetables, fruits, nuts, and oil seeds, especially soybeans), FAF5 data shows the following (including all domestic modes):

- Originating in Northeast states: 83,700 tons

- Originating in Southeast states: 23,700 tons

- Originating in Southwest states or California: 511,000 tons

- Originating in Midwest states: 547,300 tons (including 210,000 tons from Illinois, 186,800 tons from Iowa, 92,500 tons from Minnesota)

- Originating in Northern Plains states: 249.200 tons

- Originating in Idaho: 146,600 tons

- Originating in Oregon: 669.400 tons

- Originating in Washington: 18,186,900 tons

- Agricultural products total: 20,429,800 tons

Again, the geographical distribution of origins is not plausible; the portion assigned to Washington is much too large. Shares for other origin regions also are suspect. Different data sources or assumptions are required.

In the case of other prepared foodstuffs (SCTG 07, including dairy products, frozen vegetables, juices, vegetable oils, soybean meal, jams and sauces). FAF5 data shows the following (all domestic modes):

- Originating in Northeast states: 135,500 tons

- Originating in Southeast states: 23,800 tons

- Originating in Southwest states or California: 260,600 tons

- Originating in Midwest states: 205,400 tons (including 27,400 tons from Illinois, 19,200 tons from Iowa, 57,300 tons from Minnesota, 73,000 tons from Wisconsin)

- Originating in Northern Plains states: 135,900 tons

- Originating in Idaho: 91,500 tons

- Originating in Oregon: 348,800 tons

- Originating in Washington: 1,944,800 tons

- Other prepared foodstuffs total: 3,056,600 tons

Again the proportion originating in Washington is much too high. Considering the substantial volume of soybean meal exports in Washington (discussed below), the proportion of this commodity group reported as originating in the Midwest is low. Again, an alternative data source or different assumptions are required.

In the case of animal feeds (SCTG 04, including DDGS), FAF5 reports the following:

- Originating in Southwest states or California: 8,200 tons

- Originating in Intermountain states: 500 tons

- Originating in Northeast states: 12,800 tons

- Originating in Southeast states: 10,800 tons

- Originating in Northern Plains states: 7,700 tons

- Originating in Midwest states: 266,000 tons (including 84,000 tons from Minnesota, 84,000 tons from Illinois, 29,000 tons from Iowa, 6,000 tons from Wisconsin and 5,000 tons from Indiana)

- Originating in Idaho: 14,400 tons

- Originating in Oregon: 244,500 tons

- Originating in Washington: 650,400 tons

The consultant believes little to none of these volumes was exported in container form. Animal feeds from Idaho, Oregon and Washington origins moved by truck, rail carload or barge mostly to export terminals at Seattle, Tacoma or Grays harbor and to a lesser extent to export terminals on the Columbia River (Vancouver, Kalama or Longview). From other origins, it moved by truck or rail carload to those export terminals.

We now turn to other data sources for the agricultural commodities exported in bulk for which the FAF5 data on modes and origins is implausible.

Analysis of Grain, Soybeans, Soybean Meal, and DDGS

Cereal grains (SCTG code 02, including corn, wheat, rye, barley, sorghum), oil seeds (under SCTG code 03, including soybeans, canola), certain other prepared foodstuffs (especially soybean meal, under SCTG code 07), and distiller's dried grains with solubles (DDGS, a co-product of ethanol production used as animal feed, under SCTG code 04) constitute a substantial

portion on a tonnage basis of Washington waterborne exports. These commodities are exported by grain trading companies (Archer Daniels Midland, Bunge, Cargill) or grain grower cooperatives (AGP, CHS, Columbia Grain, United Grain) from large terminals situated at various points between Portland and Seattle with both rail and ocean vessel access. In the case of terminals situated on the Columbia River, inbound barge movement also is utilized. It should be noted that not all grain growing cooperatives operate export terminals. For example, Northwest Grain Growers, operating 39 origin elevators in Eastern Washington and 3 origin elevators in Eastern Oregon, operates a barge loading facility in Wallula, WA, but no grain export facility. Its grain exports pass through one of the export terminals operated by others. Typically, trading companies execute contracts with grain producers to purchase grain delivered to their export facility, whereby the producers are responsible for procuring the domestic transportation to the export facility. Trading companies re-sell the grain to East Asian distributors and arrange the ocean transportation.

Major Pacific Northwest terminals handling bulk grain exports are summarized in Table 4. As may be seen, over half the terminals are joint ventures between multiple exporters. TEMCO LLC is a joint venture of CHS and Cargill. Pacificor LLC is a joint venture of Gavilon, Archer Daniels Midland and Agrex, Inc. Export Grain Terminal (EGT) LLC is a joint venture of Bunge and the Korean company Pan Ocean, a grain distributor in East Asian markets. Over the years, the terminals have changed hands. As an example, Terminal 86 in Seattle opened in 1970, Louis Dreyfus did not start operating it until 2000. Other examples: The TEMCO LLC terminal in Tacoma was operated many years by Continental Grain. The original grain terminal in Kalama was operated by North Pacific Grain Growers, which in 1983 merged with Farmers Union Grain Terminal Association to become Harvest States Cooperatives. Then in 1998 Cenex merged with Harvest States to become Cenex Harvest States, later shortened to CHS, Inc.

Because different grain trading companies and gain export terminal operators had and still have different physical locations in the Pacific Northwest, the railroads traditionally charged the same rate from any given origin to all of the grain export terminals in the stretch from Portland to Seattle. This was done so as not to show favoritism towards any particular grain trading company or export terminal operator and thereby enable the grain trading companies to compete on an equal footing for grain tendered by inland farmers and farm cooperatives. This equalization is still true of rail rates today. It is an important factor for assessing the impact of the potential PUT on grain and oil seed shipments.

The consultant believes that, were the PUT to be imposed, the railroads would continue to equalize rates for grain and oil seed shipments to Portland, Vancouver, Kalama, Longview, Tacoma and Seattle. That is, any consequent increment in rail rates for grain would be applied equally to Portland and the Washington destinations.

The cooperatives (Columbia Grain, United Grain, AGP, CHS) shown in Table 4 operate country elevators and processing plants that dispatch rail, truck or barge shipments to export terminals or barge trans-load terminals. In some cases, they also operate barge trans-load terminals along the Snake or Columbia Rivers. Some data in this regard is provided below in Table 5.

Table 4
Major Pacific Northwest Grain, Oil Seed and Soybean Meal Export Terminals

Location	Operator	Commodities	Est. Annual Volume (metric tons)	Handle Unit Trains?
Portland, OR, Terminal 5	Columbia Grain	Cereal grains (02), Oil seeds (03), Animal feeds (04)	2.0M (as much as 4.5M in the past)	Unit trains
Portland, OR, Cargill-Irving elevator	TEMCO LLC	Cereal grains (02), Oil seeds (03). Animal feeds (04)	0.5M	No unit trains
Vancouver, WA	United Grain Corp.	Cereal grains (02), Oil seeds (03)	6.0M	Unit trains
Kalama, WA KEX	Pacificor LLC	Cereal grains (02), Oil seeds (03), Animal feeds (04)	2.0M	Unit trains
Kalama, WA TEMCO	TEMCO LLC	Cereal grains (02), Oil seeds (03), Animal feeds (04)	4.0M	Unit trains
Longview, WA	EGT LLC	Cereal grains (02), Oil seeds (03), DDGS (04), Soybean meal (07)	5.5M	Unit trains
Grays Harbor, WA	AGP	Soybeans (03), Soybean meal (07), DDGS (04)	2.5M (expansion underway)	Unit trains
Tacoma, WA	TEMCO LLC	Cereal grains (02), Oil seeds (03), Animal feeds (04)	2.5M	Unit trains
Seattle, WA, Terminal 86	Louis Dreyfus	Cereal grains (02), Oil seeds (03), Animal feeds (04)	5.0M	Unit trains

Source: Terminal operator and port web sites. The Cargill-Irving elevator is situated on the Willamette River near the Broadway Bridge in Portland. DDGS stands for distiller's dried grains with solubles. DDGS is a co-product of ethanol production and is used as animal feed (SCTG code 04).

Table 5
Origin Elevators and Processing Plants Operated by Large Cooperatives

Type of Facility	Location	Operator
High-capacity shuttle train origin elevators	7 in ND, 8 in MT	Columbia Grain
Smaller origin elevators	1 in MB, 1 in MN, 7 in ND, 14 in MT, 7 in ID, 9 in WA	Columbia Grain
Barge loader	Wilma (Clarkston), WA	Columbia Grain
Barge loader	Central Ferry, WA	Columbia Grain
Origin elevators	39 in WA, 3 in OR	Northwest Grain Growers

Barge loader	Wallula, WA	Northwest Grain Growers
Barge loader	23 other locations in Snake-Columbia Rivers system	Various
Soybean meal processing plant	1 in MO, 1 in NE, 1 in SD, 1 in MN, 6 in IA	AGP
Origin elevators	5 in NE	AGP
Biodiesel plants (generating DDGS as byproduct)	1 in MO, 1 in NE, 3 in IA	AGP
Origin elevators	~ 1,100 in PNW, Northern Plains, and Midwestern states shipping in aggregate 2 billion bushels/year of grain and oil seeds	CHS
Origin elevators	1 in SD, 1 in ND, 4 in MT, 1 in ID, 6 in OR	United Grain

Source: Company web sites. Cooperatives operating export terminals also receive grain and oil seeds from origin elevators operated by other cooperatives. Grain trading companies generally do not operate origin elevators.

Brief History of Rail Transport of Grain

In the 1800s, grain was moved in sacks loaded into boxcars. Beginning in 1911, boxcars were fitted with temporary grain doors, initially made of wood and later of corrugated cardboard reinforced with metal strapping. The grain door extended partway up the door opening of the boxcar, with the top left open so that a chute could be inserted for loading grain in bulk. Once loaded, the outside sliding door of the boxcar was closed. Unloading boxcars was even more awkward: The grain door had to be removed or punctured to allow the grain to flow out, and then the car had to be swept out. Large terminals installed tilt unloaders, but the boxcars had to be uncoupled and unloaded one by one, a slow and laborious process.

The weight capacity of 40-foot boxcars was 50 tons. In 1961, the first covered hopper cars for hauling grain were introduced. Covered hoppers are equipped with hatches on the roof for flood loading and discharge gates on the bottom for flood discharge of the grain load through grates in the track at the unloading terminal. These cars dramatically reduced the time and effort required for loading and unloading. The first covered hopers had flat sides and accommodated up to 100 tons of grain. During the late 1960s, the 1970s and the early 1980s, covered hoppers gradually displaced boxcars for hauling grain in the USA, with the last boxcar shipments of grain occurring in 1984. During the 1970s, the cubic capacity of the 100-ton covered hoppers gradually increased from 4,427 cu. ft. to 4,750 cu. ft., able to accommodate 100 tons of just about any grain.

In the boxcar era, there were many small elevators strung out on relatively dense branch-line networks in grain-producing regions. Local freight trains would pick up one or several grain loads generated at each elevator and bring them to a switch yard where long-distance trains would be assembled. In concert with the introduction of covered hoppers, the railroads provided incentive rates for multiple loads in 100-ton cars tendered to the railroad at once. This induced a

transition to fewer, larger country elevators generating more carloads per train pick-up. Initially, there were 10-car rates, then 25- or 26-car rates (1980s), then 50- or 52-car rates (late 1990s). In 2001, the BNSF railroad instituted 110-car "shuttle train" trainload rates (single origin, single destination, with strict limits on load and unload times). This angered some farm cooperatives, who had just spent the money to construct larger elevators and longer side tracks to load 52 cars at once. Now, they were being given an incentive to load 110-car trains quickly, before they had time to re-coup the previous investment costs. However, over time, the BNSF shuttle train service proved to be very popular. BNSF shuttle trains to PNW export terminals originate in Midwestern states, in the Dakotas and Montana, and to a much smaller extent in eastern Washington, passing through the Columbia Gorge on the Washington side, and then proceeding north from Vancouver, WA, if destined to an export terminal located north of Vancouver.[5]

Union Pacific also offers unit train rates and service to PNW export terminals from origins on its lines in Idaho and Midwestern states. UP also partners with Canadian Pacific to offer unit train service from origins on CP lines in Minnesota and the Dakotas. UP/CP shuttle trains load at USA points, cross the Canadian border at Portal, ND, then re-enter the USA at Eastport, ID, where the shuttle trains move on to UP rails, passing through Spokane and eastern Washington and then following the Oregon side of the Columbia Gorge to Portland. UP and UP/CP unit trains reach PNW grain export terminals located north of Portland by exercising trackage rights over the BNSF tracks.

In 1995 the Western railroads began offering grain transportation in covered hoppers with cylindrical sides with 5,150 – 5,200 cu. ft. of space, able to accommodate 111 US tons (100.7 metric tons) of corn, wheat or soybeans. This required upgrading the tracks with stronger, heavier steel rails only available from Japanese steel companies.[6] As a result, the industry has standardized on the 111-ton covered hopper as the largest that can be accommodated by state-of-the-art rail metallurgy.

Grain is still shipped in single-car lots, in 26-car lots, and in 52-car lots. But the lion's share, more than 85% by tonnage, of rail shipments to Pacific Northwest export terminals are now in unit trains of 100-130 cars (UP/CP) or shuttle trains of 110-130 cars (BNSF). With each car housing 111 tons of grain or soybeans, one train hauls 11,000 – 14,400 metric tons of grain.

A long-standing problem of grain transportation by rail was the seasonal nature of the traffic. During the Fall months, after harvests were completed, orders for grain cars surged. Destination terminals could not handle the avalanche of shipments. Sidings and switchyards all the way back into Eastern Washington became filled with grain carloads awaiting movement and unloading. Car shortages resulted. The backlog typically was not cleared until sometime in the late Winter or early Spring months. Then, traffic subsided until the next harvest.

[5] The State of Washington supported the development of two shortlines in Eastern Washington using 100-ton cars loaded at smaller elevators on former branch lines of Union Pacific and Burlington Northern. Grain loads from multiple origins are collected into trains that operate to barge terminals on the Columbia River or to BNSF shuttle train terminals.

[6] An effort in the early 1970s by Union Pacific to haul soda ash in covered hoppers accommodating 125-ton loads resulted in premature rail failure.

During the era the railroads were regulated, cars were supplied to fill car orders from origin elevators on a first-come, first-serve basis, without consideration of length of haul or quantity ordered (both important to railroad profitability). This was viewed as unfair by some shippers, in that origin elevators with affordable transportation alternatives (e.g., those located close to a barge terminal) had equal priority to receiving rail cars as elevators lacking affordable alternative transportation.

After the railroads were deregulated in the mid-1980s, Burlington Northern (a predecessor of BNSF) introduced an auction system for securing empty grain car supply. It termed the item auctioned a "Certificate of Transportation" (COT). COTs were and continue to be auctioned for single cars, for multiple car lots and for shuttle trains to be delivered in future time frames. This market mechanism continues under BNSF. Union Pacific introduced a similar program it calls the Grain Car Allocation System (GCAS) covering unit trains originating on its lines and on the joint-service CP lines. Reservation certificates are not tied to a particular origin-destination pair and auction bids are independent of the O-D pair.

At present, there is a complex structure for rail charges for grain and oil seed shipments. First, there is a base rate per carload from a given origin zone to a given destination zone. There are differing base rates per carload for single carload moves, multiple carload moves meeting minimum car counts, and shuttle train moves meeting larger minimum car counts. More favorable base rates are provided for repeated year-round shipping than for one-time moves. Fuel surcharges are added to base rates based on a mileage rate applied to the car-miles of the move. While both railroads index their fuel surcharge rates to changes in diesel fuel prices tracked by EPA, BNSF and UP have very different scales for their base rates and their per-car-mile fuel surcharges. For shuttle train movements, rates also are adjusted depending on the allowed loading and unloading times; there are increasing charges as the allowed times increase.

On top of that, shippers not contracting for continuous year-round shipping must secure a COT or GCAS certificate that is auctioned to the highest bidder by the railroads. The number of certificates auctioned is a function of the number of train sets and cars in circulation less the number already committed through contracts or previous auctions. In off-season, the fee for a COT may be relatively modest or even zero; in peak season, it can be very pricey. Thus the transportation cost paid by the origin elevator operator, including base rate plus fuel recovery surcharge plus COT auction price, can be different for each successive train that is loaded.

Rail grain rates are confidential. Generally, base rates are roughly proportional to mileage. However, there are areas where there is competition between BNSF and UP/CP and areas where one railroad has the territory to itself. In the eastern Dakotas, BNSF and UP/CP are competitive. But in the western Dakotas and Montana, UP/CP has little or no presence, enabling BNSF to charge higher rates. In a 2002 initiative to encourage more business to PNW export terminals, BNSF cut base rates for shuttle trains originating in western Minnesota and the eastern Dakotas to levels considerably less than its rates from origins in Montana and the western Dakotas. This backfired for the railroad: Farmers in the Western Dakotas trucked their grain to elevators in the eastern Dakotas to take advantage of the rates. Montana grain shippers could not economically truck to the elevators in the eastern Dakotas, so they initiated political action and legal challenges

asserting unfair treatment. As a result, BNSF was forced to divulge its tariff of base rates for grain shipping to counsel representing the State of Montana. The consultant was able to secure access to BNSF base rates for wheat in effect as of 2005. BNSF 2005 carload rates for 110-car or longer unit trains to Washington ports, Gulf of Mexico ports and Duluth-Superior are summarized in Table 6.

Table 6
2005 BNSF Carload Rates from Selected Origin Areas for 110-car or Longer Unit Train Shipments of Cereal Grains (Wheat, Barley, Oats or Corn)

Origin Area	To PNW Ports	To Houston-Galveston	To Duluth-Superior
Minnesota	$3,900 - $4,100	$4,200	$1,325 - $1,550
NW Missouri	$4,550	$1,950 - $2,050	-
Kansas	-	$2,050 - $2,675	-
Eastern Nebraska	$4,350 - $4,500	$2,250 - $2,400	-
Western Nebraska	$4,125 - $4,300	$2,500 - $2,900	-
Eastern Colorado	$4,125	$2,650 - $2,800	$2,225 - $2,300
Eastern Wyoming	$4,125	$4,675 - $4,825	$2,225 - $2,300
Eastern Dakotas	$3,800 - $3,950	$2,400 - $2,500	$1,500 - $1,700
Western Dakotas	$3,700 - $3,800	$4,200	$1,750 - $3,000
Eastern Montana	$3,500 - $3,700	$4,200	$3,125 - $3,350
Central Montana	$2,750 - $3,500	-	$4,125 - $4,600
Idaho	$1,550	-	-
Eastern Washington	$1,000 - $1,600	-	-

Note: These are base rates for shipments made in unit trains of covered hoppers with a 100-ton weight capacity. No fuel surcharges were in effect for such shipments at that time. Excluded is the cost of a Certificate of Transportation.

On an on-going basis, the US Department of Agriculture publishes rail base rates for grain shuttle and unit train shipments and estimated fuel surcharges monthly for selected origin-destination pairs. These are not intended to provide guidance as to the precise charges assessed by the railroads, but rather as indices to assess changes in rail pricing for grain shipments over time. Table 7 provides an extract of the USDA data for February, 2023, including reported destinations in the Pacific Northwest as well as a few others. Rates shown in Table 7 provide a sense of scale for current shuttle train rates; the actual, specific rates vary depending on a host of factors, including whether shipments are contracted throughout the year or are one-time shipments, allowed loading time at origin, and other requirements. It should be emphasized that rates are higher for shipments not meeting these requirements, e.g., using 100-ton cars instead of 111-ton shuttle train cars, smaller car counts, shipments to destinations not able to handle shuttle trains, etc. Note also that base rates Minneapolis – Tacoma and Minneapolis – Portland are identical, reflecting the long-standing policy of equalizing rates to PNW export terminals operated by different grain trading companies.

The consultant researched the miles for the rail routes actually utilized by loaded BNSF and UP grain trains for certain O-D pairs appearing in Table 7; the consultant's calculated mileages are presented in the fifth column of the table. Evidently, USDA estimates the fuel surcharges based on its estimates of mileages multiplied by the railroads' surcharge rates per car-mile. Mileages reported by USDA for Union Pacific moves are reasonably consistent with the consultant's figures. BNSF mileages reported by USDA are about the same to Portland but are about 100 miles shorter to Tacoma than the consultant's figures. In reality, BNSF loaded grain trains follow the route through the Columbia River Gorge in lieu of the shorter but more steeply-graded route to Tacoma via Stevens Pass and Seattle, which seems to have used by USDA in its figures for the fuel surcharge.

The consultant believes that, in reality, fuel surcharges to all PNW grain export terminals are equalized, just like base rates are equalized. This equalization is not shown in the ninth column of the table, as the precise values of fuel surcharges to PNW grain export terminals charged by the railroads are unknown to the consultant.

Comparing 2005 rates in Table 6 to 2023 rates reported by USDA in Table 7 for shuttle train movements of wheat, a scaling factor in the rate per carload in the range 153%-171% is evident. Assuming a scaling factor of 160%, Table 8 presents estimated 2023 BNSF carload rates (excluding the COT) for selected origin and destination areas.

The price of a BNSF COT train reservation certificate or a Union Pacific GCAS reservation certificate varies by time of year and by how peaked shipping demand becomes that year. Figure 1 provides a graph of BNSF COT auction high bids in its Northern Region (which includes all its origins shipping to PNW ports) over the last 8 years. As may be seen, auction prices are normally zero or close to zero in the late winter and early spring but reach a peak in November and December when car supply becomes very tight. In the Fall of 2018, prices exceeded $600 per car for shuttle trains, and in the Fall of 2021 prices reached $550 per car. In contrast, in the Fall of 2020 and the Fall of 2022, prices only reached about $200 per car, and in the Fall of 2019, when weak harvests and trade frictions reduced grain exports, the car supply never tightened and auction prices remained close to or at zero. The all-time high for train reservation certificates was reached in the Fall of 2014, when auction bids per car exceeded $3,000.

Table 7
February 2023 Rail Grain Shuttle Train Tariffs for Selected Origin-Destination Pairs

Commodity	O-D Pair	RR	Mileage (USDA)	Mileage (Consul-tant)	Base rate	Fuel sur-charge	Rate per carload (USDA)	Rate per carload (Consul-tant)	Rate per metric ton	Rate per bushel
Wheat	Great Falls, MT - Portland, OR	BNSF	880	771	$4,393	$326	$4,719	$4,678	$46.86	$1.28
Wheat	Grand Forks, ND - Portland, OR	BNSF	1,520	1,412	$6,051	$562	$6,613	$6,573	$65.67	$1.79
Wheat	Grand Forks, ND - Galveston, TX	BNSF	1,583		$5,399	$586	$5,985		$59.43	$1.62
Wheat	Colby, KS - Portland, OR	UP	1,599	1,646	$5,923	$847	$6,770	$6.795	$67.23	$1.83
Wheat	Wichita, KS - Galveston, TX	BNSF	685		$4,311	$253	$4,564		$45.33	$1.23
Corn	Minneapolis, MN - Portland, OR	BNSF	1,851	1,801	$5,660	$685	$6,345	$6,326	$63.01	$1.60
Corn	Minneapolis, MN - Tacoma, WA	BNSF	1,836	1,932	$5,660	$679	$6,339	$6,375	$62.95	$1.60
Corn	Sioux Falls, SD - Tacoma, WA	BNSF	1,695	1,833	$5,620	$627	$6,247	$6,298	$62.04	$1.58
Corn	Lincoln, NE - Galveston, TX	BNSF	988		$4,360	$366	$4,726		$46.93	$1.19
Corn	Council Bluffs, IA - Stockton, CA	UP	1,899		$5,580	$703	$6,283		$62.39	$1.58
Soybeans	Minneapolis, MN - Portland, OR	BNSF	1,851	1,801	$6,400	$685	$7,085	$7,066	$70.36	$1.91
Soybeans	Sioux Falls, SD - Tacoma, WA	BNSF	1,695		$6,350	$627	$6,977	$7,028	$69.29	$1.89
Soybeans	Fargo, ND - Tacoma, WA	BNSF	1,507	1,584	$6,250	$558	$6,808	$6,836	$67.60	$1.84
Soybeans	Council Bluffs, IA - New Orleans, LA	UP	1,160		$5,095	$615	$5,710		$56.70	$1.54
Soybeans	Grand Island, NE - Portland, OR	UP	1,637	1,640	$5,730	$868	$6,598	$6,599	$65.52	$1.78
DDGS	Council Bluffs, IA - Aberdeen WA	BNSF	2,017	2,047	$6,200	$323	$6,523	$6,957	$65.23	
DDGS	Council Bluffs, IA - Modesto, CA	BNSF	1,904		$6,100	$305	$6,405		$64.05	

Source: USDA. Notes: Rates shown are for shuttle trains 110 cars or longer consisting only of covered hopper cars with a weight capacity of 111 US tons, i.e., 100.7 metric tons. Rates for shorter trains or trains of 100-ton cars are higher. Rates depend on whether for contracted year-round shipments or for individual shipments. Rates also depend on loading time. Wheat and soybeans weighs 60 pounds per bushel, so a shuttle train rail car holds 3,687 bushels of wheat or soybeans. Corn weighs 57 pounds per bushel, so a shuttle train rail car holds 3,700 bushels of corn. Distiller's dried grains with solubles (DDGS) are a less dense product and use a different kind of covered hopper car accommodating 100 metric tons of DDGS. Fuel surcharges are mileage-based; for wheat, corn and soybeans, BNSF applies $0.37 per car-mile while UP applies $0.53 per car-mile. For DDGS, BNSF applies $0.16 per car-mile. Excluded is the auction cost to secure an empty train set for shipments of wheat, corn or soybeans. BNSF auctions a Certificate of Transportation (COT) months ahead of desired loading date. Union Pacific operates a similar auction under its Grain Car Allocation System (GCAS).

Table 8
Estimated 2023 BNSF Carload Rates from Selected Origin Areas for 110-car or Longer Shuttle Train Shipments of Cereal Grains (Wheat, Barley, Oats or Corn)

Origin Area	To PNW Ports	To Houston-Galveston	To Duluth-Superior
Minnesota	$6,240 - $6,560	$6,720	$2,120 - $2,480
NW Missouri	$7,280	$3,120 - $3,280	-
Kansas	-	$3,280 - $4,280	-
Eastern Nebraska	$6,960 - $7,200	$3,600 - $3,840	-
Western Nebraska	$6,600 - $6,880	$4,000 - $4,640	-
Eastern Colorado	$6,600	$4,240 - $4,480	$3,560 - $3,680
Eastern Wyoming	$6,600	$7,480 - $7,720	$3,560 - $3,680
Eastern Dakotas	$6,080 - $6,320	$3,840 - $4,000	$2,400 - $2,720
Western Dakotas	$5,920 - $6,080	$6,720	$2,800 - $4,800
Eastern Montana	$5,600 - $5,920	$6,720	$5,000 - $5,360
Central Montana	$4,400 - $5,600	-	$6,600 - $7,360
Idaho	$2,480	-	-
Eastern Washington	$1,600 - $2,560	-	-

Note: These are estimated base rates for shipments made in unit trains of covered hoppers with a 110-ton weight capacity, derived by applying a 160% scaling factor to the figures in Table 5. Excluded is the cost of a Certificate of Transportation.

Train reservations are auctioned weekly by the railroads for shipments to be made months in advance. Facing the risks of high reservation prices in the Fall or Winter, uncertain market opportunities, and uncertain harvest volumes, many origin elevators purchase reservations well in advance of peak season, but then wind up wishing to re-sell unneeded reservations during the ensuing months. For this purpose, a secondary market for re-auctioning shuttle trains is conducted by third-party brokers. Figure 2 displays the eight-year history for shuttle-train auction bids in the secondary market. Now we see a different picture of transactions between shippers (as opposed to transactions between shippers and the railroad). Train sets are being secured for prices as high as $3,500 per car (in the Fall of 2017, a time when the railroad only received $250 per car in its original auction). At other times, recipients of train sets received payments of as much as $500 per car to take an unneeded train set off the hands of another shipper; in such cases, the recipient shipper is able to ship its grain to the export terminal at a discount to the railroad's tariff, whereby another shipper has in effect made up the difference.

To put the various charges in perspective with respect to the potential PUT, consider a wheat shipment from a high-capacity elevator in the Eastern Dakotas to a PNW grain export terminal involving a 125-car grain shuttle train. According to Table 8, the base rate plus fuel surcharge is about $6,200 per car. Suppose the railroad auctioned the COT to the shipper for $200 per car, and that COT is being used for this shipment. With prompt loading and unloading, the total payment to the railroad is 125*($6,200 + $200) = $800,000. Wheat weighs 60 pounds per

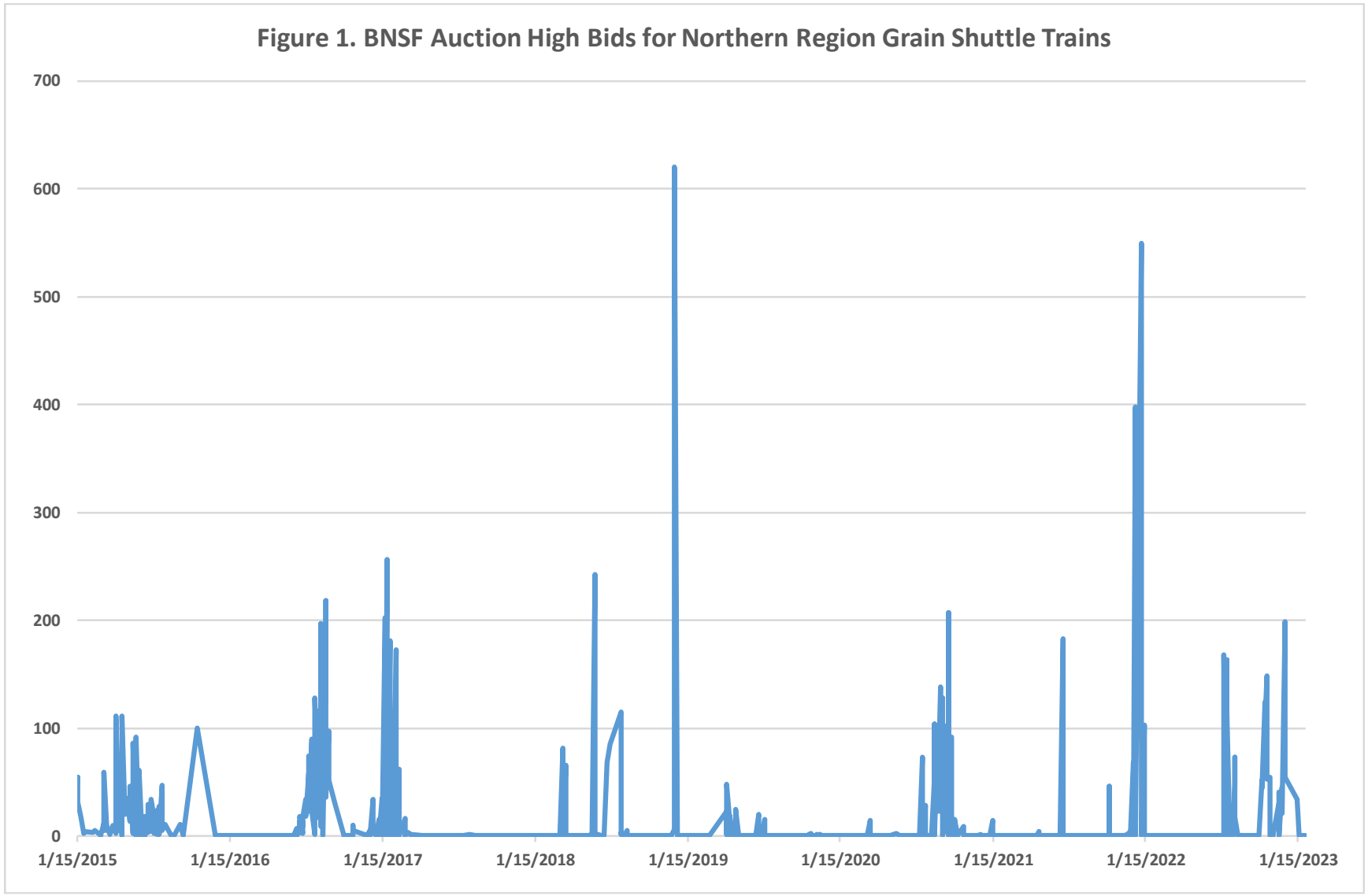
Figure 1. BNSF Auction High Bids for Northern Region Grain Shuttle Trains
700
600
500
400
300
200
100
0
1/15/2015
1/15/2016
1/15/2017
1/15/2018
1/15/2019
1/15/2020
1/15/2021
1/15/2022
1/15/2023

Source: USDA

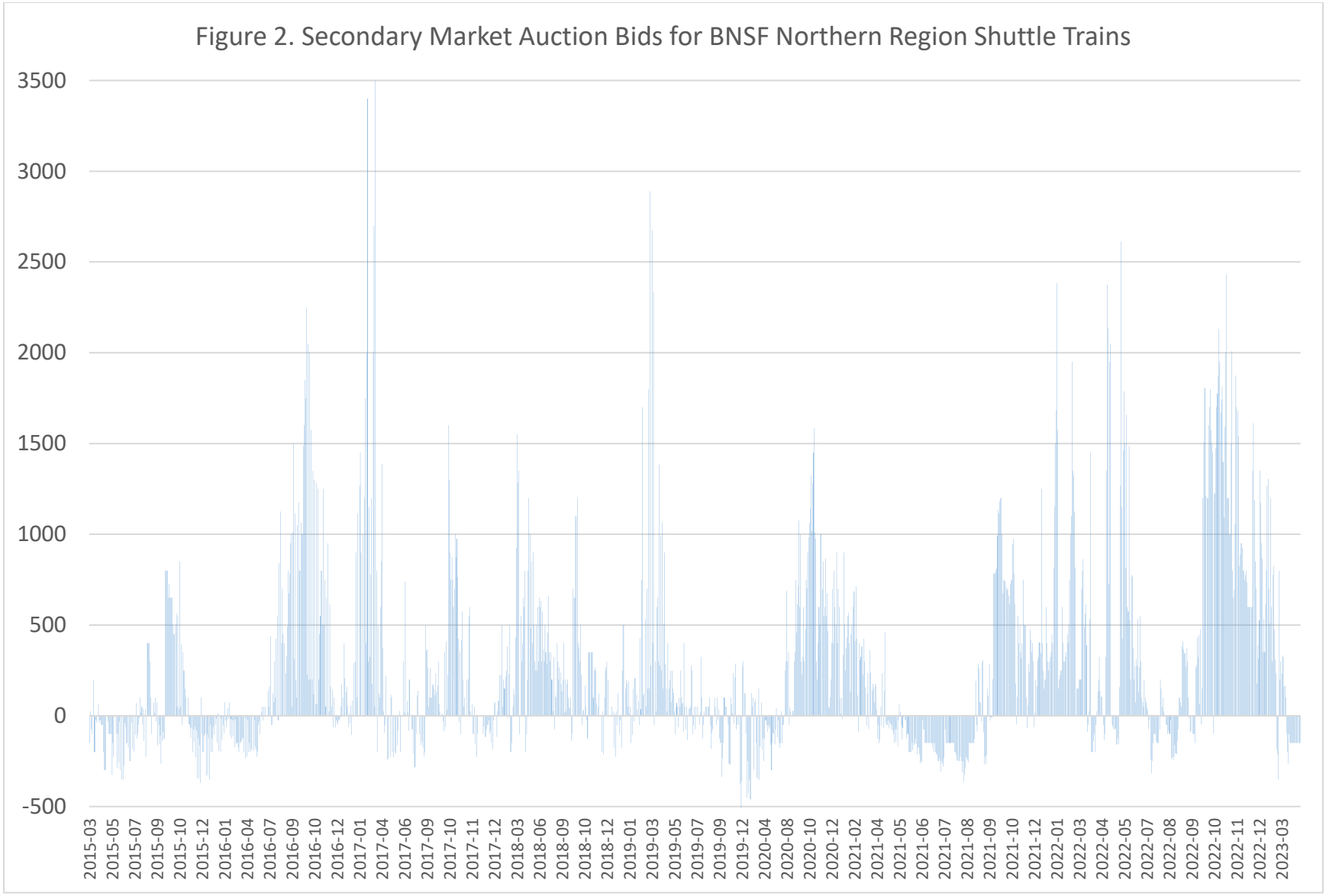
Figure 2. Secondary Market Auction Bids for BNSF Northern Region Shuttle Trains
3500
3000
2500
2000
1500
1000
500
0
-500
2015-03
2015-05
2015-07
2015-09
2015-10
2015-12
2016-01
2016-04
2016-07
2016-09
2016-10
2016-12
2017-01
2017-04
2017-06
2017-09
2017-10
2017-11
2017-12
2018-03
2018-06
2018-09
2018-10
2018-12
2019-01
2019-03
2019-05
2019-07
2019-09
2019-12
2020-04
2020-08
2020-10
2020-12
2021-02
2021-04
2021-05
2021-06
2021-07
2021-08
2021-09
2021-10
2021-12
2022-01
2022-03
2022-04
2022-05
2022-07
2022-08
2022-09
2022-10
2022-11
2022-12
2023-03

Source: USDA

bushel, so the train is hauling 125*111*2000/60 = 462,500 bushels of wheat. The transportation cost works out to be $800,000/462,500 = $1.73 per bushel. If the PNW grain trading companies are buying wheat at $9 per bushel, the shuttle train comprises a $4.16 million sale of grain. At about 19% of the sale price, the $800,000 transportation cost is a significant expense.

To quantify the PUT assessment, suppose the grain is shipped from Enderlin, ND, on the Canadian Pacific, to Kalama, WA, via CP/UP. The total rail mileage is 1,625.9, of which 208.4 miles are within Washington, or 12.8%. The PUT assessment is (0.01926)*(0.128)*$800.000 = $1,972, or $0.004 per bushel. If instead the grain is shipped from Jamestown, ND, on the BNSF, to Kalama, the total rail mileage is 1,475.3, of which 306.5 miles are within Washington, or 20.8%, The PUT assessment is (0.01926)*(0.208)*$800,000 = $3,205, or about $0.007 per bushel.

On a per-bushel basis, the PUT assessment is miniscule. But on a trainload basis, it amounts to thousands of dollars. To comprehend the potential for diversion as a function of transportation costs to PNW export terminals, and assuming the railroads pass the PUT expense through to shippers, it is helpful to consider the issue from the perspective of an origin elevator purchasing the transportation.

When deciding when and where to market its grain production, the country elevator cooperative examines grain trading prices in various destinations less the landed transportation cost, estimated in future time frames. A cooperative located in, say, southern Minnesota, has many options: PNW grain export, Duluth-Superior grain trading establishments, flour mills in the Twin Cities, feed lots in Iowa or Nebraska, grain export via Houston/Galveston, or grain export via Mississippi River barges and the port of New Orleans. For all origins, the choice of timing is a difficult one: What will future grain prices be like? What will future transportation charges be like? For some locations, the choice of destination is easy: For grain growers in the Pacific Northwest states or Montana, transportation costs to other markets besides the PNW export terminals are prohibitive; their grain will be marketed through the PNW ports. For grain growers located close to the Mississippi River, their choice also is easy: Send the corn in barges down the Mississippi to New Orleans. But in some origin regions, the market price less landed delivery cost for alternative destinations is very close. And the relative values of alternative destinations change over time.

Until the 1970s, almost all the grain grown in the Northern Plains (Dakotas and Eastern Montana) moved to Duluth-Superior. The large Soviet grain purchases in the early 1970s started the trend of marketing Northern Plains grain and Midwestern grain through the PNW ports. At present, more than 80% of the Northern Plains grain crop moves to the PNW ports.[7] Virtually no Midwestern grain moved to PNW ports before the 1970s; now, some fraction of Midwestern

[7] Out of 53,407 total rail carloads of wheat shipped from Montana in 2004, 44,851 carloads of wheat were shipped to PNW ports, or about 84%. The percentage is higher now.

grain also moves to the PNW ports. Almost all the grain grown in Colorado, Kansas, and Missouri, and most of the exported grain grown in Iowa moves to Gulf ports.

Soybeans produced in Iowa normally move down the Mississippi River to New Orleans for export to East Asia. But two years ago, record-low water levels in the Mississippi drove up barge prices to the point that shipment by shuttle train to PNW export terminals become more attractive. Soybean exports via PNW terminals surged, then later settled down after water levels in the Mississippi recovered.

The US Dept. of Agriculture publishes statistics on grain production by state. States and grain production organizations provide estimates on the percentage of production that is exported. These data are summarized in first six columns of Table 9.

The consultant researched State websites to estimate the percentage of wheat, corn and soybean crops exported in bulk vs. ending up in domestic consumption or domestic processing into foodstuffs. The consultant then made estimates of the PNW shares of regional bulk exports. These estimates are displayed in the sixth and seventh columns of the table. The eighth column translates these estimates into metric tons, and the ninth column shows the consequent origin mix for PNW bulk exports of grain and soybeans.

The consultant's judgments reflected in Table 9 show that bulk grain exports via the PNW ports originate only in Upper Midwest, Northern Plains and Pacific Northwest states, The total tonnage of exported bulk grain is about 41.7 million metric tons; about 15.3 million metric tons, or more than 36%, was shipped to PNW export terminals from the Dakotas. According to FAF5 data, the total tonnage of STCG codes 02, 03 and 04, respectively, cereal grains, other agricultural products (mostly oil seeds such as soybeans), and animal feeds, exported from the Port of Portland in 2019 was 2.12 million metric tons; and according to Table 3, the total Washington bulk exports of these commodity groups in 2019 is estimated as 39.3 million metric tons. The total (41.5 million metric tons) compares reasonably well with the total derived in Table 9.

In the consultant's opinion, grain exports via the Washington ports from Washington and Oregon will not be diminished by imposition of the potential Washington PUT and grain exports from Idaho and Montana would be diminished only marginally, considering the considerable increment in transportation costs to reach alternative markets, and the railroads' policy of equalizing rates to Portland and Washington terminals. Moving further east, grain producers increasingly can find competitive alternatives to exporting via the PNW ports, and so the impact of the potential PUT grows, assuming it is passed through by the railroads to the shippers. In the eastern Dakotas and Upper Midwest, grain producers can sell to flour mills in the Upper Midwest or to grain trading companies in Duluth-Superior. In the Central Midwest, grain producers can sell to grain trading companies exporting via New Orleans or Galveston/Houston, or sell more locally to feed lots, ethanol producers or foodstuff processors. Economic alternatives to PNW exports are increasingly attractive as one moves further away from the PNW ports.

Table 9
2021 Grain Production by Region, Estimated PNW Bulk Exports,
and Estimated Diversion Resulting from Imposition of the Potential PUT

Region	Wheat	Corn	Soybeans	Totals	Est. % Exported in Bulk	Est. PNW % Share of Bulk Exports	Est. PNW Bulk tons	Est. origin mix for PNW bulk exports	Est. % Diversion	Est. Diversion Tonnage
NE	9,173,220	137,138,067	48,735,420	195,046,707		0	0	0		
SE	6,862,200	69,202,902	38,097,000	114,162,102		0	0	0		
SW	11,834,400	16,614,588	966,300	29,415,288		0	0	0		
CA	574,800	535,800	0	1,110,600		0	0	0		
IM	439,080	788,253	0	1,227,333		0	0	0		
LMW	27,924,600	82,326,240	28,131,000	138,381,840	15	0	0	0		
CMW	5,361,000	375,409,980	99,957,000	480,727,980	15	8	5,768,736	0.138233	6	346,124
UMW	4,443,300	109,877,760	28,206,600	142,527,660	15	15	3,206,872	0.076844	6	192,412
ND & SD	14,399,700	63,581,790	23,829,600	101,811,090	30	50	15,271,664	0.365946	3	458,150
MT	6,036,600	342,000	0	6,378,600	75	100	4,783,950	0.114635	2	95,679
ID	4,592,040	1,436,400	0	6,028,440	75	100	4,521,330	0.108342	1	45,213
OR	1,903,500	752,400	0	2,655,900	90	100	2,390,310	0.057278	0	0
WA	5,230,800	1,201,560	0	6,432,360	90	100	5,789,124	0.138722	0	0
Totals	98,775,240	859,207,740	267,922,920	1,225,905,900			41,731,986			1,137,579

Source: USDA figures for 2021 grain production by state expressed in bushels were converted by the consultant into metric tons assuming 60 lbs per bushel for wheat and soybeans and 57 lbs per bushel for corn. Percentage exported vs. domestic consumption or processing are consultant's estimates. PNW shares of bulk exports are consultant's estimates.

Notes: NE (northeast) region includes MI, IN, OH, PA, WV, MD, DE, NJ, NY. CT, RI, VT, NH, MA and ME. SE (southeast) region includes AR, LA, MS, AL, KY, TN, GA, FL, SC, NC and VA. SW (southwest) region includes OK, TX, NM and AZ. IM (intermountain) region includes WY and UT. LMW (lower Midwest) region includes CO, KS and MO. CMW (central Midwest) region includes IL, IA and NE. UMW (upper Midwest) includes MN and WI.

BNSF grain shuttle train approaching the Continental Divide in Glacier Park en route from Alberta, MN, to the grain export terminal in Tacoma. This train comprises about a $4.2 million-dollar grain shipment, generating about $800,000 in revenue for the railroad and would generate about $3,200 in PUT.

As shown in the tenth column of Table 9, the consultant made the following estimates for diversion of bulk grain exports via PNW ports resulting from imposition of the potential PUT:

- From Central Midwest origins: 6%

- From Upper Midwest origins: 6%

= From North Dakota & South Dakota: 3%

- From Montana: 2%

- From Idaho: 1%

- From Oregon and Washington: 0%

These percentages are applied in Table 9 to the estimates of bulk grain export tonnages developed in the table; results are displayed in the last column. The total tonnage of bulk grain exports via PNW ports estimated to be diverted as a result of imposition of the potential PUT is about 1.2 million metric tons, or about 2.7% of total PNW bulk grain exports. Based on the assumption that the railroads will continue to equalize rates across PNW bulk export terminals after imposition of the potential PUT, the 2.7% figure would apply uniformly to the amount exported via Washington bulk export terminals for grain, as well as to Portland export terminals. Of the 39.3 million metric tons of cereal grains and oil seeds exported from Washington in bulk in 2019, the consultant estimates 1.1 million tons would be diverted to other end markets or to ports outside Oregon and Washington.

This leaves the issue of bulk exports of prepared foodstuffs (SCTG 07), principally soybean meal. In Table 3, the bulk export tonnage of this commodity group in 2019 via Washington ports is estimated as 1.2 million metric tons.

As noted in Table 5, AGP operates 10 soybean meal processing plants in the Midwest and 5 bio-diesel refineries in the Midwest generating DDGS (included in SCTG 04) as a by-product. AGP ships some of its soybean meal in unit trains or shuttle trains to its export terminal at Grays Harbor; it also ships rail carloads of DDGS to Grays Harbor as well as elsewhere. As shown in Table 4, the current export volume from the AGP facility in Grays Harbor is about 2.5 million tons per year. (The Grays Harbor web site reports that in 2020 AGP shipped 21,107 carloads to Grays Harbor, which works out to about 2.1 million metric tons of exports, and that was a record volume.) Thus the question of diversion of bulk exports of prepared foodstuffs is really a question of diversion of AGP soybean meal exports.

According to Table 7, the rail rate for a shuttle train from a soybean meal processing plant in Council Bluffs, IA, to Aberdeen (Grays Harbor) is about $6,500 per carload. The total rail mileage is 2,047.2, of which 519.4 miles are in Washington, or 25.4%. Assuming a $50 COT, the assessed PUT on a 110-car shuttle train is estimated as (0.01926)*(0.254)*110*$6,550 = $3,525 or about $0.32 per ton of soybean meal.

While the PUT per trainload is significant, AGP has made a substantial investment in Grays Harbor and is increasing its investment there. A major increase in the capacity of its export facility is scheduled to come on-line in 2025. Moreover, AGP probably can control the quality of its soybean meal exports to demanding Japanese customers much better than if it entrusted those exports to a trading company in New Orleans.

It is the consultant's opinion that bulk exports of prepared foodstuffs will not be diminished by the imposition of the potential PUT.

Diversion of Containerized Exports

Destination countries for containerized exports from the NWSA ports are summarized in Table 10. As may be seen, more than 86% of 2019 containerized exports had trans-Pacific destinations. Thus potential diversion to alternative ports for trans-Pacific exports is the primary concern for containerized exports.

Table 10
Destination Mix for 2019 Containerized Exports from the NWSA Ports

Destination Country	Export volume (TEUs)
Japan	188,615
South Korea	160,027
China	130,313
Taiwan	91,788
Philippines	34,131
Indonesia	33,148
Vietnam	27,561
Thailand	26,506
India	26,505
Malaysia	21,256
Hong Kong	21,046
Singapore	12,541
Australia	8,545
Subtotal, trans-Pacific	781,982 (86.1%)
All other	125,904 (13.9%)
Total	907,886

The nearest alternative container ports to the NWSA ports are Portland, OR, and Vancouver, BC. At present, the Port of Portland currently has only one container vessel call per week. During the period early 2015 to mid-2020, Portland had no regular container vessel service. In 2022, Portland exported 102,678 TEUs and imported 171,481 TEUs of waterborne, containerized freight. On average, 987 40-foot containers (1,975 TEUs) of imports and 669 40-foot containers (1,338 TEUs) of exports were handled per week by the Port of Portland. The channel depth of the Columbia River up to Portland is 43 feet, sufficient for state-of-the-art Ro-Ro vessels and

bulk carriers, but precluding the use of container vessels larger than 4,5000 TEUs. Portland is simply not capable of the kind of role played by the NWSA ports, the Southern California ports, and the British Columbia ports, which can accommodate post-Panamax container vessels ranging up to 16,000 TEUs. From the point of view of the ocean carriers, Portland is a niche market, not able to sustain more than one vessel call per week. From the point of view of exporters, Portland has very limited service compared to the NWSA ports. It is used for exports originating relatively close to Portland, but not for exports originating at distant inland points. Diversion of containerized exports originating in Washington is unlikely because transit to Portland involves as much or more PUT than transit to the NWSA ports for the lion's share of Washington-originated exports. In the consultant's judgment, the potential PUT is unlikely to divert a significant amount of containerized exports from the NWSA ports to Portland. The more serious concern is diversion to other ports ox exports originating at distant inland points.

For containerized shipments westbound across the Pacific, exporters benefit from shipping in the backhaul direction, meaning transportation demand in the reverse direction is greater, engendering a surplus of equipment and favorable rates. Containerized shipping from inland points to international destinations is sold by the ocean carriers, who subcontract domestic movement to truckers and railroads. The exporter pays one price for door-to-door transportation, including initial dray (truck movement), rail line haul, vessel movement, and dray from foreign destination port to destination.

Contracts between ocean carriers and railroads or draymen are confidential. The consultant estimates the fees paid by the ocean carrier to the railroads for a loaded 40-foot ISO container moving from an origin in the greater Chicago area to a vessel departing from the Port of Tacoma or the Port of Seattle are on the order of $200 for initial dray from shipment origin to origin rail terminal, and $1,500 for rail movement to the Puget Sound ports. The total amount paid by the exporter for a shipment to a receiver in China located relatively close to a Chinese container port might be on the order of $3,000. If the ocean carrier uses the BNSF railroad, the rail movement from Chicago to the Puget Sound ports stretches about 2,500 miles, about 535 miles of which are in Washington state.[8] The PUT collected by the State would amount to ($1,500)(535/2,500)(0.01926) = $6.18, or about 0.4% of the ocean carrier's landside transportation bill and 0.2% of the exporter's total transportation bill. If the ocean carrier uses the Union Pacific railroad, the rail movement from Chicago to Puget Sound stretches about 2,395 miles, about 160 miles of which are in Washington state. In that case, the PUT would amount to ($1,500)(160/2395)(0.01926) = $1.93, or about 0.1% of the ocean carrier's landside transportation bill. Of course, for exporters located closer to the Puget Sound Ports, the PUT would be a greater percentage of their transportation bill, but on the other hand, their costs of diverting to utilize non-Washington ports grow proportionately larger. In any case, it is clear that, even if the proposed PUT is passed through to the beneficial cargo owners by the

[8] BNSF has another route between Chicago and Puget Sound but with more severe grades crossing the Cascades. The stated mileage is that for the route normally utilized by trains hauling marine containers.

transportation carriers, the proposed PUT would not represent a significant financial impediment to containerized exporters.

In terms of transit time, the NWSA ports are about 1-2 days closer to Asian destinations than Oakland and 2-3 days closer than Los Angeles and Long Beach. Rail intermodal service for ocean carrier shipments originating in Montana, Idaho and the Dakotas is not available to any West Coast port; shipments must be trucked to the ports. From Oregon, Northwest Container Services retails Portland – Seattle intermodal service using Union Pacific trains. From the Northern Plains states (MT, ND, SD), rail intermodal service for the ocean carriers is not available. From Salt Lake City, intermodal service to the NWSA ports is available to Oakland and the San Pedro Bay ports but not to the NWSA ports. From Denver, service to all West Coast ports is available, but rates to the NWSA ports are higher than to California ports by $50 - $100 per 40-foot container.

Rates charged by the railroads to the ocean carriers for shipments from intermodal terminals in the Upper Midwest (MN, WI, ND) to the NWSA ports are cheaper than the rates to California ports by $100. However, rates charged by the Canadian railroads from these origin areas to British Columbia ports are competitive. From Chicago, Iowa and Nebraska origins rail rates paid by ocean carriers are generally the same to the NWSA ports and to the California ports. Rates from Chicago to the NWSA ports and the British Columbia ports are competitive, but service from Iowa and Nebraska terminals to British Columbia ports is not available. From lower Midwest origins (KS, MO, OK, AR), rates to the NWSA ports are higher than to California ports by $100 - $200 per 40-foot container, while service to British Columbia ports is not available.

States east of Chicago and north of the Mason-Dixon Line are referred to as the "Neutral East" because rates charged to ocean carriers to the various West Coast ports are equalized. South of the Mason-Dixon line, rates to the NWSA ports are generally higher than to California ports by $200 - $400 per 40-foot container.

The foregoing estimated rate differentials are summarized in Table 11.

Table 11
Estimated Differentials in Rail Rates to Ocean Carriers for Westbound 40-foot Loads via NWSA Ports vs. Alternative West Coast Ports

Origin Area	British Columbia	Oakland	San Pedro Bay
Upper Midwest	$0	$100	$150
Central Midwest	$0	$0	$0
Lower Midwest	$200	-$100	-$200
Northeast	$50	$0	$0
Southeast	$200	-$200	-$400
Southwest	N/A	-$300	-$500

Notes: No intermodal terminals in the Northern Plains states (MT, ND, SD). No intermodal terminals in Intermountain states (UT, WY) providing service to the NWSA ports. No

intermodal service from Southwestern states (OK, TX, AZ, NM) to British Columbia ports. Upper Midwest states include MN and WI. Central Midwest states include IN, IL, IA and NE. Lower Midwest states include CO, KS and MO.

According to Table 11, containerized imports originating in the Southwest, Southeast, Lower Midwest, and Northeast are at risk of diversion from the NWSA ports from imposition of the potential PUT. Risk is minor from the Northeast region, moderate from Lower Midwest, and relatively high from the Southeast region. Containerized exports from the Southwest region moving by rail to the NWSA ports are almost nonexistent and so are ignored. California exports moving via the NWSA ports are almost all trucked and so California is omitted from the table.

Considering the transit time savings of using the NWSA ports and the small dollar amount of the PUT, these risks are small. The consultant makes the following estimates of diversion for the proposed PUT:

- From the Northeast: 4%
- From the Southeast: 6%
- From the Lower Midwest: 6%
- From the Central Midwest: 4%
- From the Upper Midwest, Northern Plains and PNW states: 0%
- From California: 2%
- From the Southwest: 0%
- From Intermountain states: 2%

These percentages are applied in Table 12 to estimate diversions of containerized exports from the NWSA ports resulting from imposition of the PUT. As may be seen, total diversion is estimated as slightly less than 4,300 TEUs.

The railroads also require the ocean carriers to balance westbound container flows with eastbound import flows in order not to have to reposition well cars between ports. When exports are much less than imports such as at present, this can be accomplished by controlling flows of empty containers and by pricing domestic backhauls, i.e., without constraint on export shipments. But if export volumes rise high enough, the carriers may need to raise prices for IPI exports made via the NWSA ports, considering the much greater import flows via the California ports than via the NWSA ports. In the consultant's opinion, this is not likely in the foreseeable future.

Table 12
Estimated PUT-Induced Diversions of Containerized Exports from Washington

Com-modity Group	Metric Tons of Exports via Seattle – Tacoma – Grays Harbor Ports Broken Out by Origin Region (FAF5 data)										Est. tons of NWSA TEUs	Est. break-bulk tons	Est. tons diver-ted	Est. contain-erized tons diver-ted	Est. tons per TEU	Est. TEUs diver-ted
	SCTG Code	CA SW	IM	SE	NE	Low MW	Cen MW	Upp MW	NP	Total						
Ag. products	03	44.6	0.0	2.2	64.7	13.0	19.6	32.7	15.1	191.9	2,649.0		4.3	4.3	9.28	428
Prepared food-stuffs	07	30.1	0.8	4.3	83.0	2.5	32.7	97.7	13.6	264.7	1,538.4		5.1	5.1	10	505
Pulp and paper	27	0.4	0.0	18.9	7.3	0.0	3.5	27.4	0.0	57.5	1,181.0		1.6	1.6	10	157
Wood products	26	0.7	0.3	1.3	4.1	0.4	11.9	42.5	1.4	62.6	502.4		0.7	0.7	10	75
Base metals	32	0.4	0.0	3.0	13.2	0.5	7.6	1.1	0.0	25.8	317.5		1.0	1.0	10	104
Cereal grains	02	10.4	0.1	0.0	0.2	14.7	20.6	1.1	7.4	54.5	282.2		1.7	1.7	10	172
Meat and seafood	05	10.9	0.0	14.8	6.6	8.9	279.1	55.7	40.0	416.0	273.3	142.7	12.9	8.4	10	844
Machi-nery	34	17.7	0.7	15.6	78.7	13.9	300.1	258.9	12.3	697.9	195.4	502.5	16.9	4.7	10	474
Nonme-tallic mineral pro-ducts	31	3.3	0.0	18.9	15.0	0.5	1.1	2.4	0.0	41.2	137.0		1.8	1.8	10	181

Textiles and leather	30	0.3	0.0	1.3	2.7	2.2	7.7	5.5	0.7	20.4	110.0		0.6	0.6	5	63
Motor vehicles & trnspn. eqpt.	36-37	3.6	0.0	3.5	50.8	1.2	60.5	14.4	4.0	138.0	79.8	58.2	4.7	2.7	5	274
Misc. mfg. goods	40	0.9	3.3	1.5	8.1	0.3	4.9	13.0	0.7	32.7	82.6		0.7	0.7	7.5	69
Basic chemi-cals	20	1.3	0.0	1.2	5.4	0.6	6.6	0.5	52.7	68.3	72.4		0.6	0.6	7.5	59
Plastics & rubber goods	24	0.9	0.1	1.5	8.1	1.1	13.4	12.3	1.8	39.2	64.8		1.0	1.0	3.565	102
Other		14.1	3.8	20.2	44.4	8.8	101.5	163.7	39.3	395.8	851.3		7.7	7.7	7.5	765
Totals		139.6	9.1	108.2	392.3	68.6	870.8	728.9	189.0	2,506.5	8,337.1	703.4	61.3	61.3		4,272

Notes: Origin region codes are as follows: CA = California, SW = southwestern states (AZ, NM, OK, TX), IM = intermountain states (UT, WY), NP = northern plains states (MT, ND, SD), LowMW = lower Midwestern states (CO, KS, MO), CenMW = central Midwestern states (IN, IL, IA, NE), UppMW = upper Midwestern states (MN, WI), NE = northeastern states (MI, OH, PA, WV, NY, MD, DE, NJ, CT, RI, MA, NH, VT, ME), SE = southeastern states (AR, LA, MS, AL, KY, TN, GA, FL, SC, NC, VA). Not shown are exports originating in ID, OR, WA, AK or HI which are judged by the consultant to be unaffected by the potential PUT.

Import and export container trains on BNSF pass in Glacier Park. An export container loaded in the greater Chicago area and moved by BNSF to the Port of Seattle would generate about $6.20 in PUT.

Waterborne Exports to Canada

A relatively small export volume (27,900 tons in 2019) by water to Canada is reported by FAF5. This tonnage is all in commodity groups normally exported in containerized form. Presumably, this volume is shipped to Vancouver Island or other British Columbia points. Alternative service using non-Washington ports would be much more expensive and much more time-consuming, if even available. In the consultant's opinion, impact of the proposed PUT on such shipments is negligible.