

Tar Sands/Dilbit Crude Oil Movements Within the Salish Sea

Prepared
by

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for



April 2016

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ABSTRACT

This paper evaluates the movement of barges carrying heavy crude oil (“dilbit”) derived from bitumen, or “tar sands,” within the ecologically rich but vulnerable waters of the Salish Sea.

In particular, it focuses on the transits between the Kinder Morgan oil terminal in Burnaby, BC and the U.S. Oil refinery in Tacoma, WA from 2010 to 2014. The purpose of this analysis is to document the frequency, volume and location of dilbit crude oil shipping within the Salish Sea. Recommendations are made on how to better prevent and respond to dilbit crude oil spills that pose unique challenges, including being prone to sink. The need to quickly institute these findings is underscored by the proposed expansion of Kinder Morgan’s Trans Mountain Pipeline and its associated 7-fold increase in tar sands-carrying oil tankers.

A comparison is also made of the exports of various forms of crude oil from the U.S. Oil refinery with the other four refineries in Washington from 2010 to 2014. The purpose of this analysis is to document the volume and frequency with which refineries have delivered crude oil directly to outbound tankers without refining.

The importance of documenting that refineries can and have already used their docks as crude oil export terminals has taken on greater significance since Congress lifted the ban on the export of domestic crude oil in late 2015.¹



INTRODUCTION

This paper focuses on the movements of crude oil derived from Alberta's vast reserves of bitumen referred to as "oil sands" or "tar sands" through the Salish Sea. Tar sand oil is diluted with lighter volatile products to enable it to be shipped by pipeline, rail or tanker. This combination is known as "dilbit," for diluted bitumen. For the rest of this paper the term dilbit will be used rather than tar sands given that is the form in which tar sands are transported through the Salish Sea. It is important to note that bitumen is diluted with a variety of products, each posing unique spill response challenges, but will be collectively referred to as dilbit.

The difficulty and unmet needs for responding to a dilbit crude oil spill motivated this new analysis of oil spill risk in the Salish Sea. The reasons for this concern were rigorously documented in a report published by the National Academy of Sciences (NAS) in 2016.² Fortunately, the NAS study was released while this paper was being completed enabling its findings to be incorporated herein.

The vulnerability of the Salish Sea to a spill of dilbit crude oil is further heightened by the poorly publicized proposal to triple the Kinder Morgan/Trans Mountain Pipeline that connects the vast supplies of bitumen in Alberta, Canada to an oil terminal in Burnaby, BC. The proposal would result

in an increased capacity to ship dilbit crude from 300,000 bbls/day to 890,000 bbls/day.³ A 2014 vessel traffic risk assessment, (VTRA 2010) concluded the proposal would result in a 7-fold increase in tanker traffic transiting through the Salish Sea as compared to 2010. The number of dilbit-carrying oil tankers would increase from approximately 1 per week to 1 per day, significantly increasing the amount of oil being transported through the San Juan Islands in Haro Strait and Boundary Pass (Appendix 1).⁴

This paper focuses on existing dilbit shipments between Kinder Morgan's Burnaby, BC terminal and the U.S. Oil & Refining Co. refinery in Tacoma, WA in order to elevate public attention for the need to improve oil spill prevention and response capabilities within the Salish Sea. In addition, it is intended to identify the significant risk associated with Kinder Morgan's proposed expansion of dilbit crude shipping through the Salish Sea.

Dilbit crude oil is currently shipped from the Burnaby terminal through the Salish Sea on tankers bound to ports on the west coast and overseas. It is also transported within the Salish Sea approximately six times a month (see results section) on barges towed by conventional tugs through the particularly fast currents along Rosario Strait, Admiralty Inlet and Puget Sound. Though tankers carry more oil than barges, tug and tow marine transport is of higher risk due to the limited maneuvering capabilities and risks of tow wires snapping.

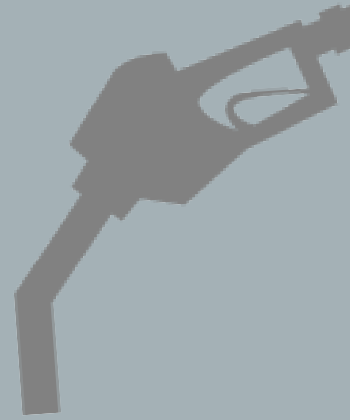
Sause Brothers, a U.S. Oil & Refining Co contractor based in Coos Bay, Oregon owns and operates the barges used in this trade. This is the same company that experienced a tug snapping the tow wire of its barge, Nestucca, in heavy seas along the Olympic Coast in the winter of 1988.⁵ The Nestucca was full of heavy, Bunker C oil bound to the ARCO Refinery

at Cherry Point, Washington. ARCO is now owned and operated by BP. The resulting 231,000 gallon oil spill spread 800 square miles, from Newport Oregon to the west side of Vancouver Island. Much of it remained partially submerged due to its density. Still, it was estimated that over 56,000 seabirds were killed.⁶ This incident is not intended to reflect on Sause Brothers' current operations, on which we have no information, but to highlight what could occur from increased numbers of barges operating in the region.

More recently, there have been a series of incidents involving tugs towing a variety of cargo along Rosario Strait between 2011 and 2013, including collisions with navigational aids. Coast Guard Sector Puget Sound issued voluntary Marine Safety Advisory 16630⁷ on October 9, 2012 after 5 incidents with tugs and tows in Rosario Strait between October 10, 2011 and December 23, 2011. Two additional incidents occurred on May 23, 2013 and September 8, 2013 since the issuance of the Safety Advisory. The Advisory was incorporated into the Puget Sound Harbor Safety Plan (Appendix 4) but no state or federal regulations have been proposed since then.

On March 2, 2016 two barges were being towed when high winds blew them to shore near Victoria, BC. One barge, carrying two thousand liters of diesel fuel, was removed the next day. The other, carrying construction debris, took weeks to be removed from the beach. See "Grounded barge was a warning"⁸ and "Work begins to unload, remove barge grounded off Dallas Road."⁹ Once again on March 15, 2016 a U.S. tug and barge bound for Alaska carrying general cargo touched bottom near Campbell River, BC.¹⁰

Canadian tugs have suffered a similar fate. In 2015 alone, six tugs have sunk in nine incidents along the British Columbia¹¹ coast. The fact that modern barges are equipped with double hulls does little to assuage concerns about this form of oil transportation. A 2011 study questioned the effectiveness of double hulls in reducing vessel-accident oil spillage.¹² Utilizing U.S. Coast Guard vessel accident pollution incidents between 2001 and 2008 the authors found that on average double hulls reduced the size of oil spills by only 20 percent in barges and 62 percent in tankers.



BACKGROUND

The recent history of barge incidents and documentation of the movements of barges carrying dilbit crude oil within the Salish Sea underscores the need to make improvements to the region's oil spill prevention and response capacity. Even if the proposed expansion of the Trans Mountain Pipeline does not occur, the oil currently moving within and through the regions necessitates the recommendations in this paper.

The Salish Sea is one of the world's largest and richest inland seas. It spans most of the inland marine waters of Washington State and British Columbia, covering 16,925 square kilometers, including 419 islands and 7,470 kilometers of coastline. It has a maximum depth of 650 meters. It is home to 37 species of mammals, 172 species of birds, 247 species of fish, and over 3,000 species of invertebrates – approximately 113 of which are either listed as threatened or endangered in Canada and the United States. The Salish Sea is also home to a surrounding human population of approximately 8 million, including many sovereign tribal governments that are endemic to North America.¹³

Marine resources are intrinsic to the culture and economy of First Nations as they are referred to in Canada. In the United States tribal governments have treaties with the federal government that grant them property rights to the bounty of the Salish Sea.

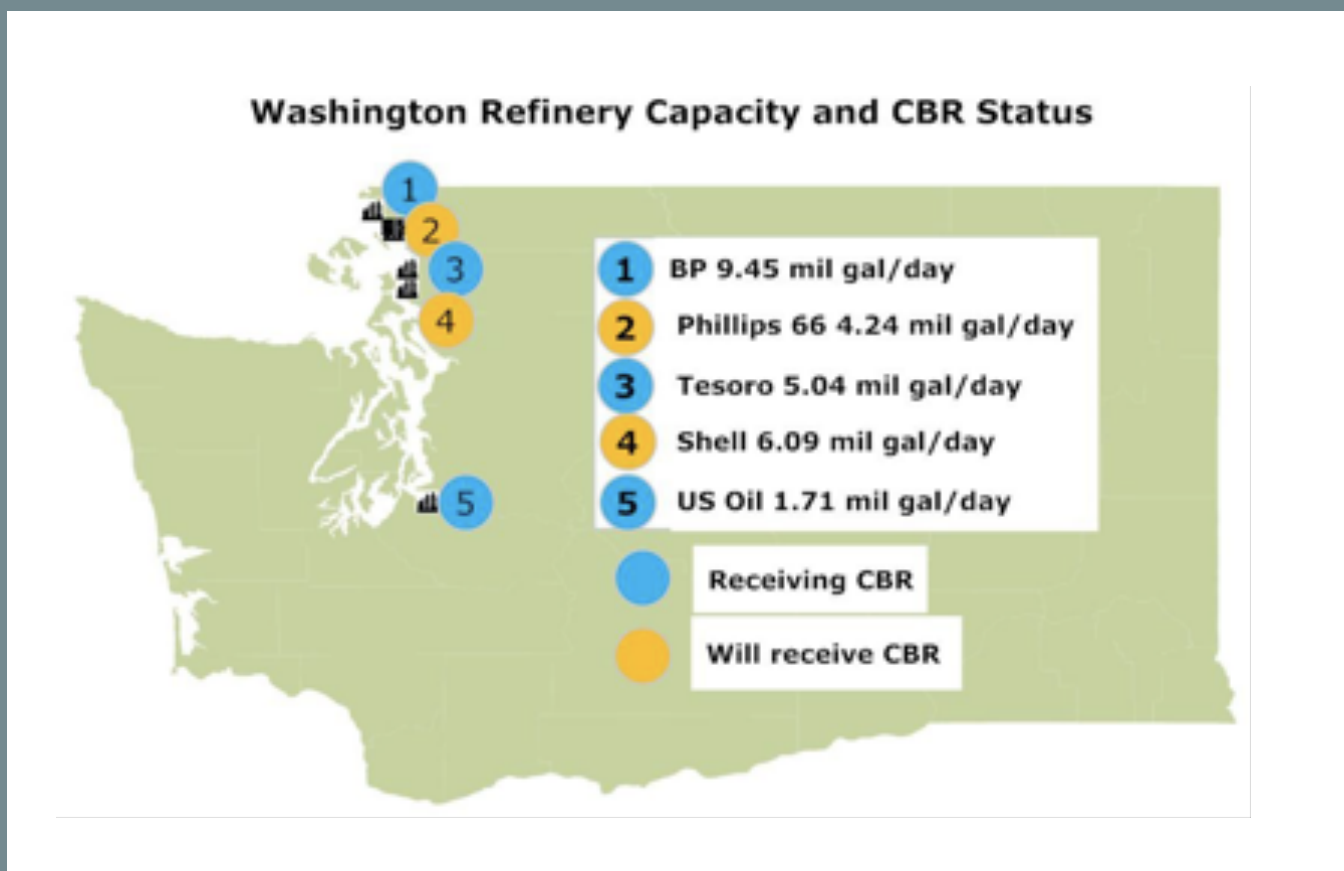
Washington State is also a major U.S. oil-refining center with five refineries adjacent to the Salish Sea capable of processing over 9.5 billion gallons annually (26 mgal/day) (Figure 2).¹⁴

Since 1956 three of the four North Sound refineries were constructed to receive crude oil from Alberta via the Trans Mountain Pipeline. The newest refinery, ARCO, was built in 1971 and purchased by BP in 2002 to handle Alaska's North Slope crude oil by tankers as well as Alberta crude from the pipeline.

The Salish Sea

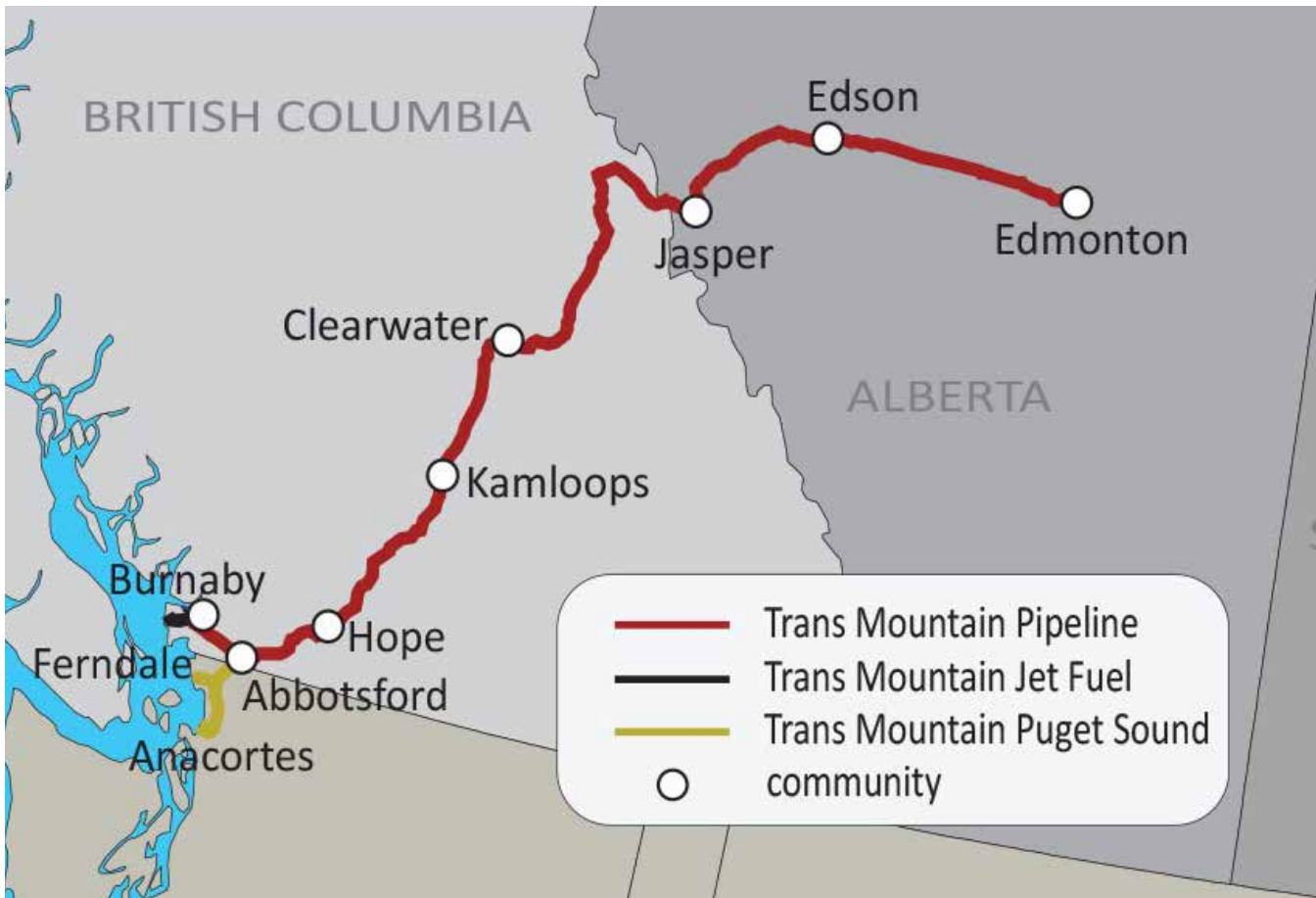


Figure 1



Washington State Refinery Capacity

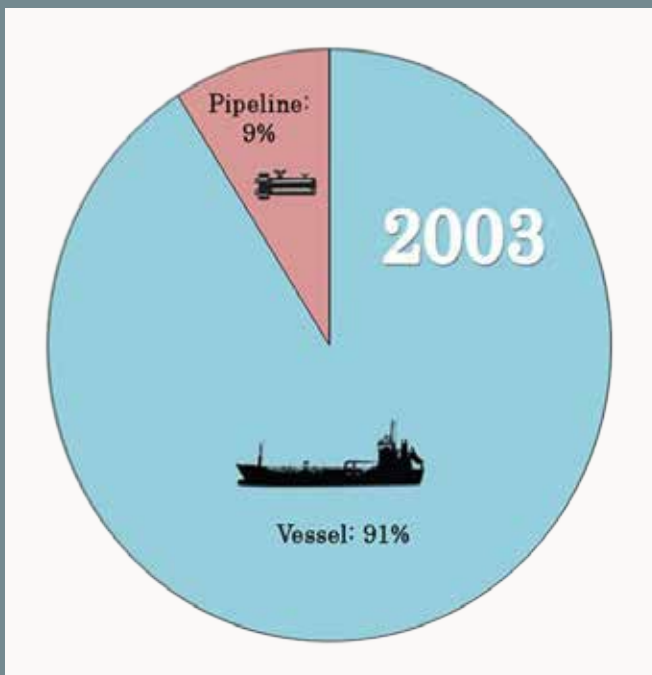
The Puget Sound Pipeline is the U.S. extension of the Trans Mountain Pipeline. It transports approximately 170,000 bbls/day to the Washington refineries. The proximity to the pipeline explains why the refineries were sited along the narrow channels leading to the Northeast shores of the Salish Sea (Figures 2 & 3).



Trans Mountain Pipeline

In recent years there have been increases made to the pump capacity along the Trans Mountain Pipeline. Some reports refer to the capacity of the Puget Sound spur as 180,000 bbls and that may be due to this expansion.¹⁵

The expansion of the only crude oil pipeline serving Washington State explains how the percent of oil Washington refineries have received by pipeline has increased from 9% to 24% between 2003 and 2013 (Figure 4).¹⁶



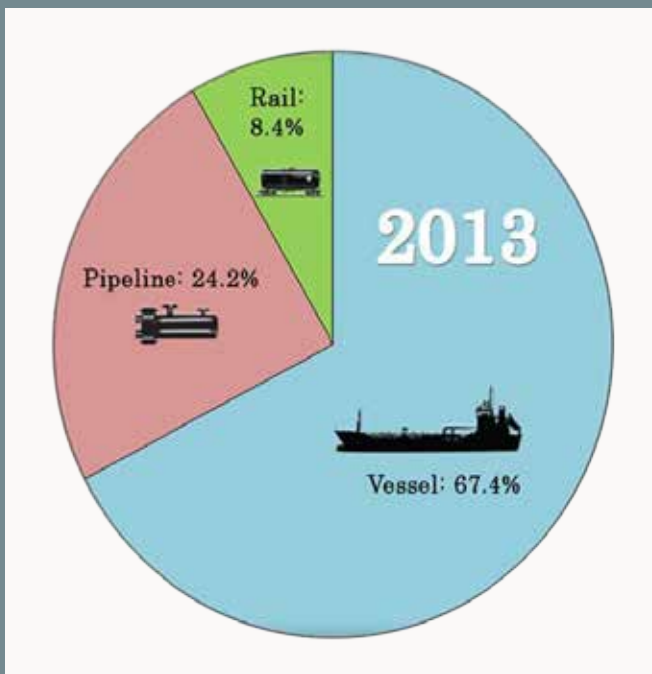
All five of the Washington refineries can also receive crude oil by tanker. Four of the five refineries have recently added the capacity to receive crude oil by rail (CBR). The first CBR terminals began operations in 2012. As of 2013 pipelines contributed three times the amount of oil as CBR (Figure 4). This proportion will fluctuate with oil prices.

Since the capacity of the pipeline and CBR cannot meet all the demands of Washington refineries and oil production from Alaska has decreased significantly, refineries have increasingly sought crude oil from international sources transported by tanker. These tankers need to navigate through the narrow straits with fast currents surrounding the San Juan Islands where oil spill response is particularly challenging.

Over the past several years new or “unconventional” oils, derived primarily from Alberta, Canada and North Dakota pose new spill response challenges. The CBR terminals were built primarily to receive a light, highly volatile oil, from the Bakken shale formations in North Dakota. The Alberta oilfields initially produced conventional crude oil but current efforts have focused on tapping into the enormous reserves of heavy bitumen that constitute the third largest source of oil in the world. As stated above, this oil is then diluted with highly volatile chemicals and synthetic products forming dilbit.

Figure 4

Changes in Crude Oil Deliveries to Washington Refineries¹⁷



Dilbit Crude Oil

Before the Salish Sea is potentially exposed to significant increases in the movements of dilbit from the proposed expansion of the Trans Mountain Pipeline, improvements to the region's response and regulatory capacity are needed.

In early 2016 a report entitled, "Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response" was published by the National Academy of Sciences (NAS) Committee on the Effects of Diluted Bitumen on the Environment.¹⁸

The 2016 NAS report states, "Broadly, regulations and agency practices do not take the unique properties of diluted bitumen into account, nor do they encourage effective planning for spills of diluted bitumen."

Evidence of such inadequate planning is found in a 2013 report of the NW Area Committee (NWAC).¹⁹ The NWAC is comprised of the federal and state regulators in Washington, Oregon and Idaho who guide oil spill response activities in the region. The "Emerging Risks" report addresses how best to respond to new types of oil and oil transportation methods. The report States, "Under the U.S. Coast Guard's definition of oils as set forth in Title 33 Code of Federal Regulations, Volume 2, Part 155, the OSP of concern - dilbit crude, synbit crude and syndilbit crude fall within the parameters of Group IV oils, similar in physical and chemical characteristics to many other heavy crude oils delivered to area refineries by tank vessel since the 1950s."

By characterizing dilbit as Group IV oil, which is lighter than sinking oils (Group V), the Emerging Risks report suggests that the response strategies for dilbit spills are the same as those needed for spills of conventional oils. The reasons for this is that the NWAC compares the fate and effects of dilbit spills in the early hours of its release into the marine environment -- prior to the evaporation of the lighter diluents and accumulation of fine sediments -- both of which significantly increase the propensity of the oil to sink.

In 2014, the U.S. Coast Guard published a Report to Congress entitled, “Risk Assessment of Transporting Canadian Oil Sands.”²⁰ While recognizing challenges in responding to a dilbit crude oil spill, the report calls for more research rather than new equipment or faster response times. On page 20 it states, “As described, the development and transportation of Canadian oil sands products presents new challenges for the maritime oil spill response community. **While effective responses to Canadian oil sands products would use existing capabilities and technologies, the response is dependent upon informed response planning to direct the use of appropriate technologies and strategies.** Response planning can be further improved and uncertainties can be minimized through increased research into Canadian oil sands products fate, behavior in aquatic environments, and potential impacts to aquatic species.” (Emphasis added)

On April 1, 2016, the U.S. Coast Guard issued Marine Safety Information Bulletin 07-16 which updates Oil Spill Response Organizations (OSROs) Guidelines to include:

- The creation of a new classification in the OSRO Guidelines: Nonfloating Oils classification. The Nonfloating Oil classification meets the regulatory requirements of Group V oils in accordance with the criteria set forth by 33 C.F.R. § 154.1047 and 33 C.F.R. § 155.1052 and the inherent risk of other heavy oil types that may submerge or sink.

The significance of this change all depends on whether the Coast Guard considers dilbit a sinking oil which is affected by whether it makes the classification before or after the oil is spilled into the environment. The Guidelines also include the following:

- Nonfloating Oil application and procedures to meticulously and qualitatively assess Nonfloating Oil classifications. The application contains pertinent information for owners and operators to appropriately determine what Nonfloating Oil classified OSROs would be best suited for their operations.

The way in which this change is implemented could have significant impact on the capacity to respond to sinking oil spills. Given the current limits of oil spill response technology it is still believed that the best modification to response plans would be to shorten response times thereby enabling responders to arrive on site prior to the oil sinking.

Regardless of the outcome of this analysis, effective November 30, 2016, all Facility and Vessel response plan holders who may handle, store, or transport Group V oils shall only list Nonfloating Oil classified OSROs or provide the required information in accordance with the regulatory Group V Response Plan Development and Evaluation Criteria. It is not clear how “providing the required information” impacts response requirements.

The National Academy of Sciences report states, “For any crude oil spill, lighter, volatile compounds begin to evaporate promptly; in the case of diluted bitumen, a dense viscous material with a strong tendency to adhere to surfaces begins to form as a residue. **For this reason, spills of diluted bitumen pose particular challenges when they reach water bodies. In some cases, the residues can submerge or sink to the bottom of the water body.** Importantly, the density of the residual oil does not necessarily need to reach or exceed the density of the surrounding water for this to occur. The crude oil may combine with particles present in the water column to submerge, and then remain in suspension or sink.” (Emphasis added). Given these greater levels of concern for weathered diluted bitumen, spills of diluted bitumen should elicit unique, immediate actions in response.²¹

Fledgling efforts have been made to address this threat in Washington (WAC 173-182-324) (Appendix 4) but there is still plenty of room for improvement. For example, State regulations still allow for 12 hours before specialized oil response equipment is required to arrive on scene. Rapid response in the Salish Sea is challenging due to regulations allowing for large distances between equipment caches, depth of the straits, speed of the current and the significant amount of silt generated by the Fraser River plume that further increases the likelihood of dilbit crude oil to sink.

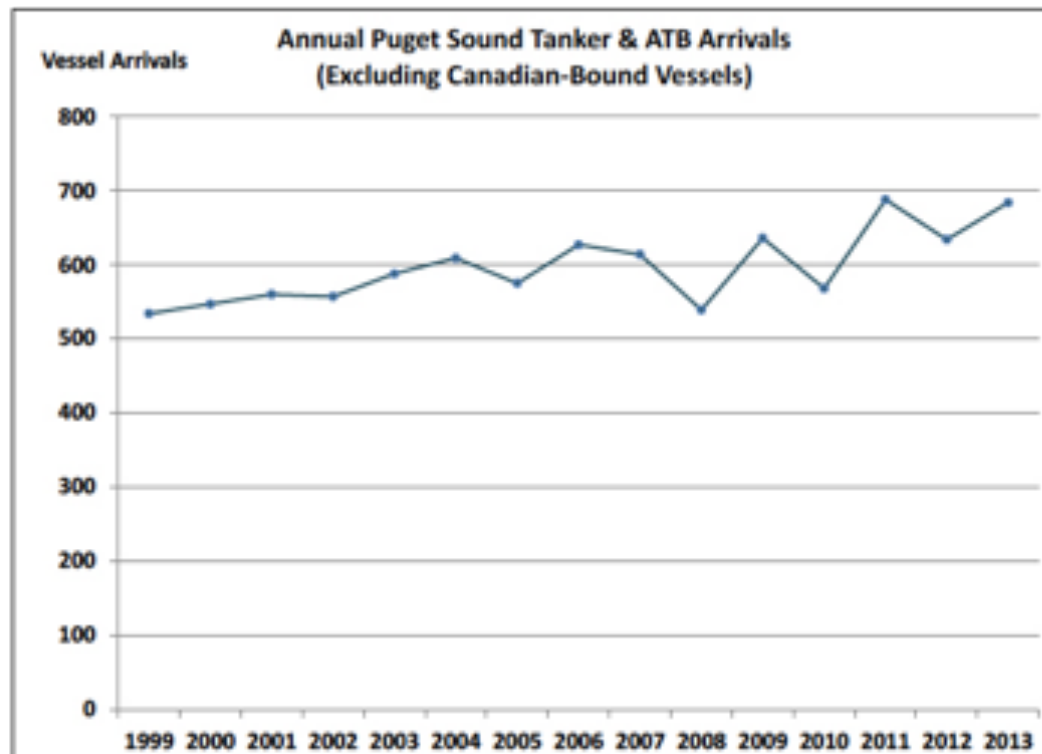
For example, in 2015 Canadian authorities proved unable to respond to even a relatively small spill of conventional oil in the protected waters of Vancouver Harbor. On April 9, 2015 the bulk carrier MV Marathassa spilled 900 gallons of bunker fuel that revealed failures of communication and spill response capabilities in near ideal conditions.²² Despite stated aspirations of creating “world class” capabilities, this incident bodes poorly for the ability to muster an international response to a dilbit spill in the swift currents typical of the Salish Sea.

Crude Oil Shipping through the Salish Sea

During the past 15 years, tankers and articulated barge (ATB) traffic calling on Washington refineries have grown by 200 transits, approaching 700 in 2013 (Figure 5).²³

ATBs are tugs that fit into a notch in the back of a barge rather than being towed behind by a cable. ATB's typically carry more oil than most barges but are more powerful and maneuverable than conventional tugs and tows. Despite being more like tankers than barges, ATBs are not treated as tankers when transiting Rosario Strait where there is a one-way rule prohibiting tankers from approaching another deep draft vessel head on to avoid collision.

Annual Puget Sound Tanker/ATB Arrivals (Excluding Canadian-Bound Vessels)



Oil Tanker and ATB Transits to Washington Ports (1999-2013)

Figure 5 does not include tankers or barges bound for British Columbia. According to data from Washington State, roughly 200 tankers a year have called on Vancouver, BC between 2010 -2014 (VEAT). While it is not possible to determine the tanker size or cargo from these data, some tankers carry large volumes of dilbit as well as refined products and chemicals, all of which pose transboundary oil spills risks.

In addition, there are numerous proposed projects to develop new shipping terminals in British Columbia. Container ships and bulk carriers do not carry oil as cargo, but the largest of which can carry up to 4 million gallons of fuel oil. Furthermore these ships congest the waterway adding considerably to the risk of a collision with tankers. If the Trans Mountain Pipeline expansion project is approved, there will a 7-fold increase in tanker traffic – from approximately one tanker per week to one tanker per day.²⁴

Even less attention has been given to the movement of dilbit crude oil being shipped between Kinder Morgan's Burnaby, BC terminal and the U.S. Oil refinery in Tacoma, Washington – the focus of this report. This oil is moved on barges being towed by conventional tugs through the particularly fast currents along Rosario Strait, Admiralty Inlet and Puget Sound without the added safety of tug escorts as is required in San Francisco Bay²⁵ and for tankers in Puget Sound.²⁶

In December 1994 the Crowley Barge 101 leaked 26,900 gallons of oil after being towed across a reef in the Northern reaches of Rosario Strait.²⁷ More recently, there have been at least seven incidents with tugs towing a variety of cargos along Rosario Strait between October 2011 and September 2013, including collisions with navigational aids (Appendix 2). Despite the frequency and severity of these incidents the Coast Guard only issued a Marine Safety Advisory²⁸ that was adopted as a voluntary "Standards of Care" for tugs and tows transiting Rosario Strait that includes the following statement:

"USCG VTS Puget Sound has observed a trend for tugs and tows transiting north or southbound in Rosario Strait to be set to the west, particularly in the southern portions of Rosario Strait where several navigational hazards exist just to the west outside the traffic lane. VTS Puget Sound will continue to employ electronic visual alarm zones within Rosario Strait to alert Vessel Traffic Management Specialists when a vessel may be departing the traffic lane and standing into potential danger so that a timely and relevant marine traffic advisory can be provided to help avert a marine casualty. "
(2015 PS Harbor Safety Plan pp 97-98, Appendix 3).



METHODS

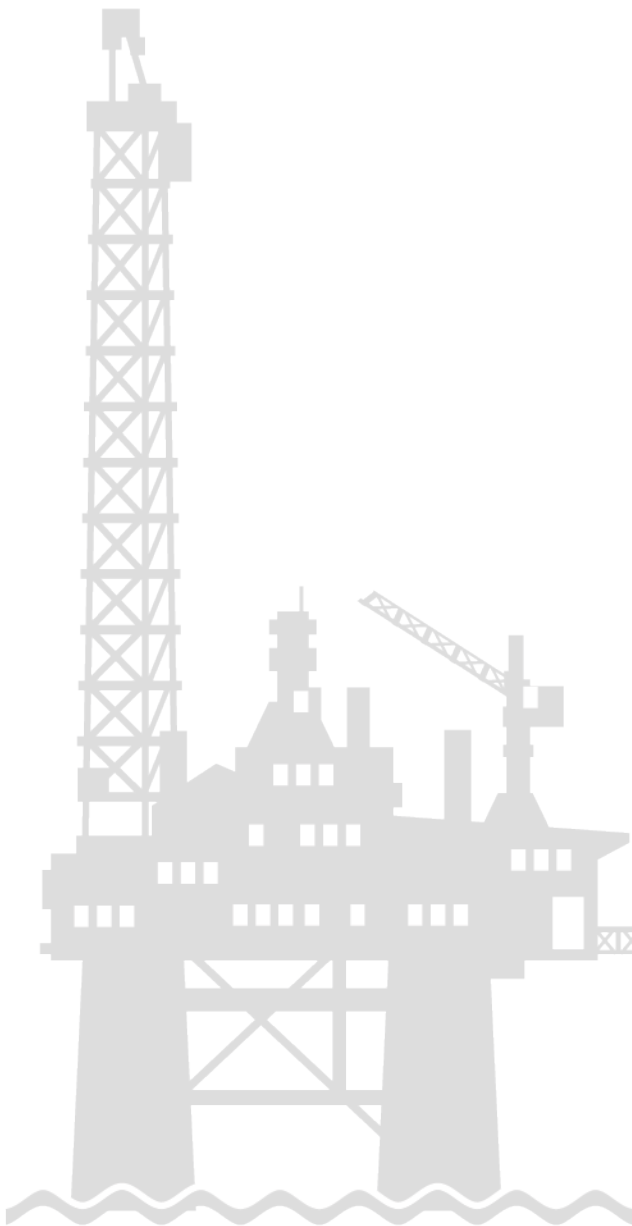
This paper focuses on the movements of heavy dilbit crude oil through the Salish Sea. Through conversations with industry and agency representatives Friends of the Earth became aware of the existing trade of dilbit between the Westridge Terminal at the terminus of the Trans Mountain Pipeline in Burnaby, BC and the U.S. Oil refinery in Tacoma, Washington. We subsequently read a brief reference to this operation in the Department of Ecology's 2015 study that reviewed changes in the way oil is transported in Washington.²⁹ This study confirmed that this trade constitutes the vast majority of dilbit transported within the Salish Sea to Washington refineries over water. It is delivered primarily by traditional tugs towing barges with a tow wire.

In order to quantify the extent to which this activity occurs in the Salish Sea, Friends of the Earth (FoE) made a series of public disclosure requests to the Washington Department of Ecology (Ecology) for copies of the Advance Notice of Transfer (ANT) database. This database includes records of oil transfers to refineries from tankers and barges in the Salish Sea. It was created to allow the Department of Ecology to oversee transfer operations and to understand the geographic distribution of oil spill risk. This paper uses these data in a novel fashion in order to better understand oil spill risk.

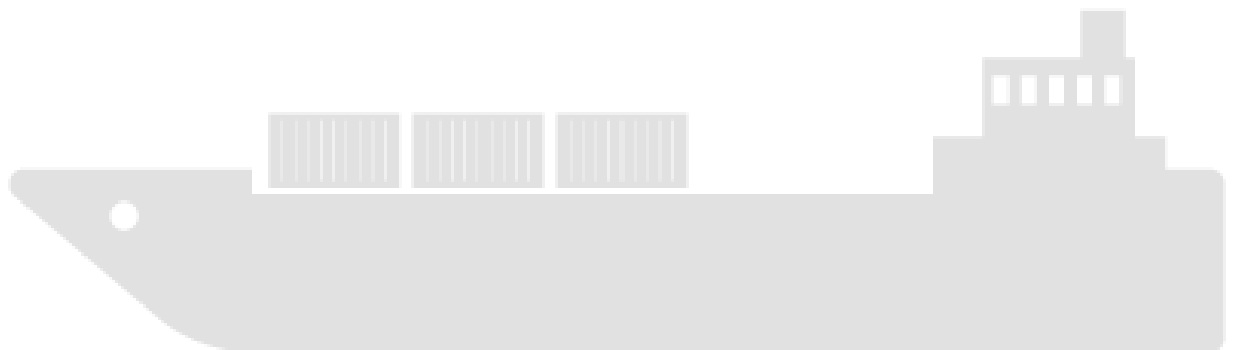
The analysis focused on the volume and number of dilbit crude oil deliveries from barges to the U.S. Oil refinery between 2010-2014. While there are numerous categories of refined products (e.g. gasoline, jet fuel), the ANT database usually only refers to crude oil as “crude” without any description as to its source. Therefore, the type of crude was deduced by understanding the nature of the oil trade. We were assisted in this analysis by relationships we have developed over the years with agency and industry representatives who have afforded us a level of insight not contained in the current database.

The veracity of the advice was supported by confirmation of the route taken by the barges documented in this paper. While Ecology’s ANT database does not specify the type of crude oil, its report provides data specifying the amount of tar sands oil for 2012-2013. This indicates there are additional data not being publicly shared. The report states that in 2013 a Sause Brothers barge made 33 trips that brought 105 million gallons of Canadian crude from Vancouver, BC to US Oil in Tacoma. We used these data to verify our 2010-2014 findings.³⁰

In addition, Ecology’s ANT database and data found in its Marine/Rail report only specify the name of the barges used to carry the oil, not the name of the tugs that pull the barges. The name of the tugs are needed in order to track the routes taken through the Salish Sea to verify the trade with Canada as well as the waterways exposed to this new risk. The reason for this is that only motorized commercial vessels, not barges, are required to have Automatic Information Systems (AIS) installed that enables remote tracking of the routes taken by these tugs and tows. The lack of AIS data for barges is problematic. We determined from the ANT database that two



80,000 bbl barges regularly offload crude oil at the U.S. Oil refinery: the Drakes Bay and Commencement Bay. Both barges are owned by Sause Brothers of Coos Bay, Oregon. Through discussions with Ecology and Sause Brothers, we confirmed that these vessels haul dilbit from Kinder Morgan's Terminal in Burnaby, BC. The barges also make occasional trips to San Francisco Bay and to Anacortes, WA. The U.S. Oil refinery can also receive crude oil—including dilbit—by tanker and rail but it is not connected by pipeline from Alberta like the four refineries in the North Sound. The source of these additional streams of crude oil could not be determined in this study.





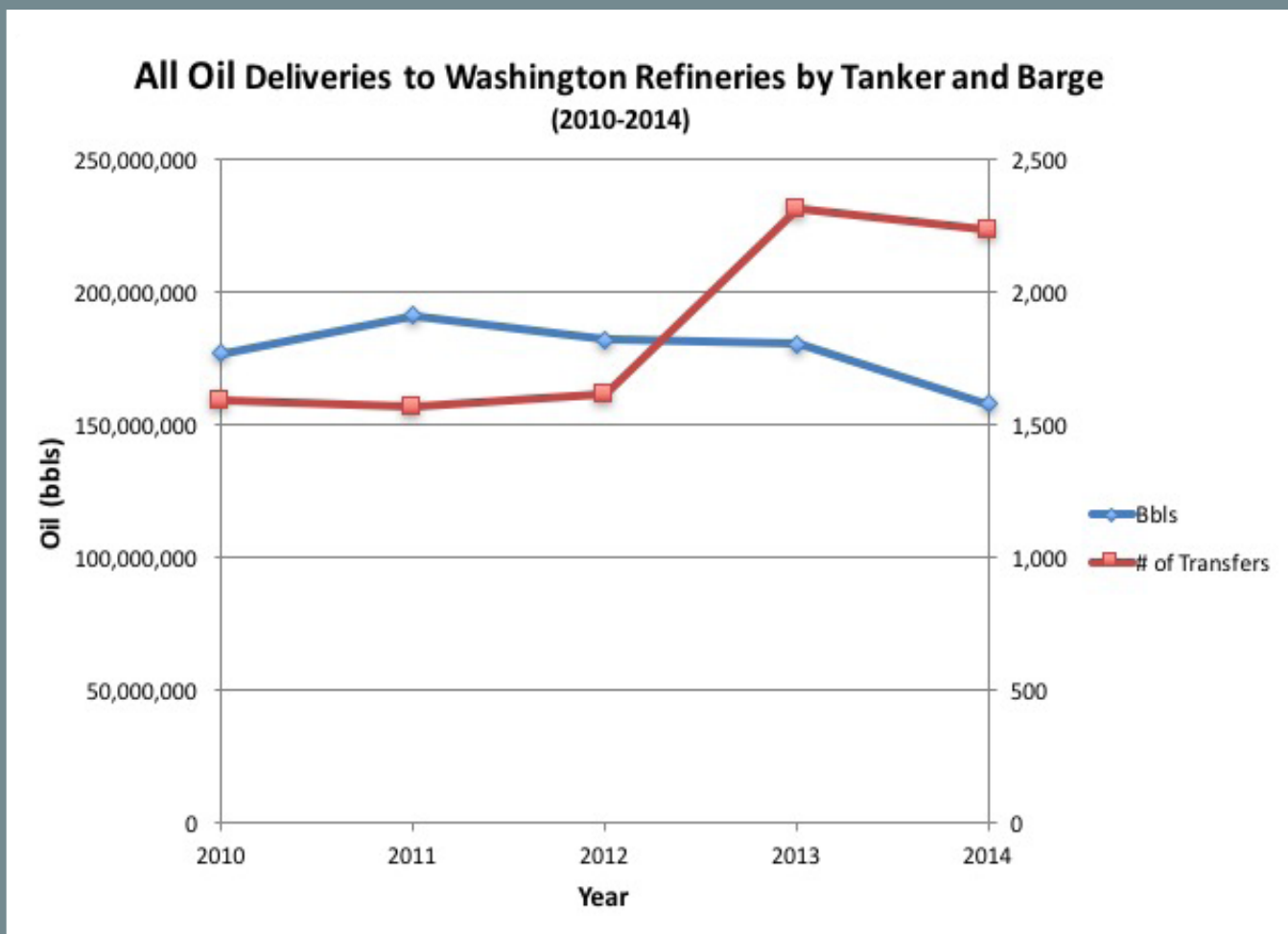
RESULTS

Risk is described as the product of probability times consequence. The juxtaposition of high volumes of oil movements in this biologically sensitive water body makes this region of high risk. This risk is heightened by the unique challenges associated with responding to a dilbit crude spill due to its tendency to sink, the depth of the shipping lanes, and the increasing volumes being transported through the Salish Sea.

The following results provide ample evidence for the need to continue to update the region's oil spill prevention and response capacity to address the new threats posed by the transport of dilbit crude oil as well as the export of crude oil.

All Oil Delivered to Washington Refineries (2010-2014)

Figure 6



Volume and Frequency of Crude and Refined Oil Delivered to Washington State Refineries by Tanker and Barge

Figure 6 depicts both the volume and frequency of all oils delivered to Washington refineries by tankers and barges between 2010-2014.

Between 2010-2014 a total of 866,338,352 barrels of oil were delivered on 9,316 separate occasions. There was a 29% increase in the frequency of oil deliveries by tanker and barge (from 1,591 to 2,234) but the volume of oil delivered declined by 5% (from 165 mbbls to 157 mbbls) over the same period. (Ecology 2010-2014 ANT).

The fact that the number of tanker deliveries to refineries increased while the volume of oil transferred decreased appears contradictory.

It can be explained because of the increase in use of ATBs to move oil. ATB transits within the Salish Sea increased from zero in 2010 to 723 in 2014. During the same period, the number of tankers bound to Washington ports from Juan de Fuca Strait decreased by 35% (from 548 to 358)(VEAT 2010-2014). These data also do not include the 200 tankers on average (with unknown content) bound to British Columbia facilities annually (VEAT 2010-2014).

Since ATBs primarily carry refined oil in smaller volumes (150,000-320,000 bbls) as compared to a typical crude oil tanker (approximately 785,000 bbls), there can be a reduction in the volume of oil delivered despite a greater number of deliveries.

Conventional oil barges in the Salish Sea (tug and tow) carry between 20,000 and 80,000 bbls of oil. The perception that barges pose less of an oil spill risk due to their smaller size is countered by the fact that between 2010 and 2014, there have been approximately 3,200 annual transits of oil barges carrying bunker fuel and other oil products within the Salish Sea (VEAT 2010-2014). Crude oil that is received by rail is also shipped from the Columbia River to Washington refineries. Tug companies Kirby and Harley have been using traditional tow-wire barges to move oil out of Clatskanie, BC (Port Westward), bound for the BP and Phillips 66 refineries at Cherry Point.

The balance of refinery demand is made up by the use of four existing crude by rail terminals in the Salish Sea with a combined capacity of 419,000 bbls per day (Table 4).³¹

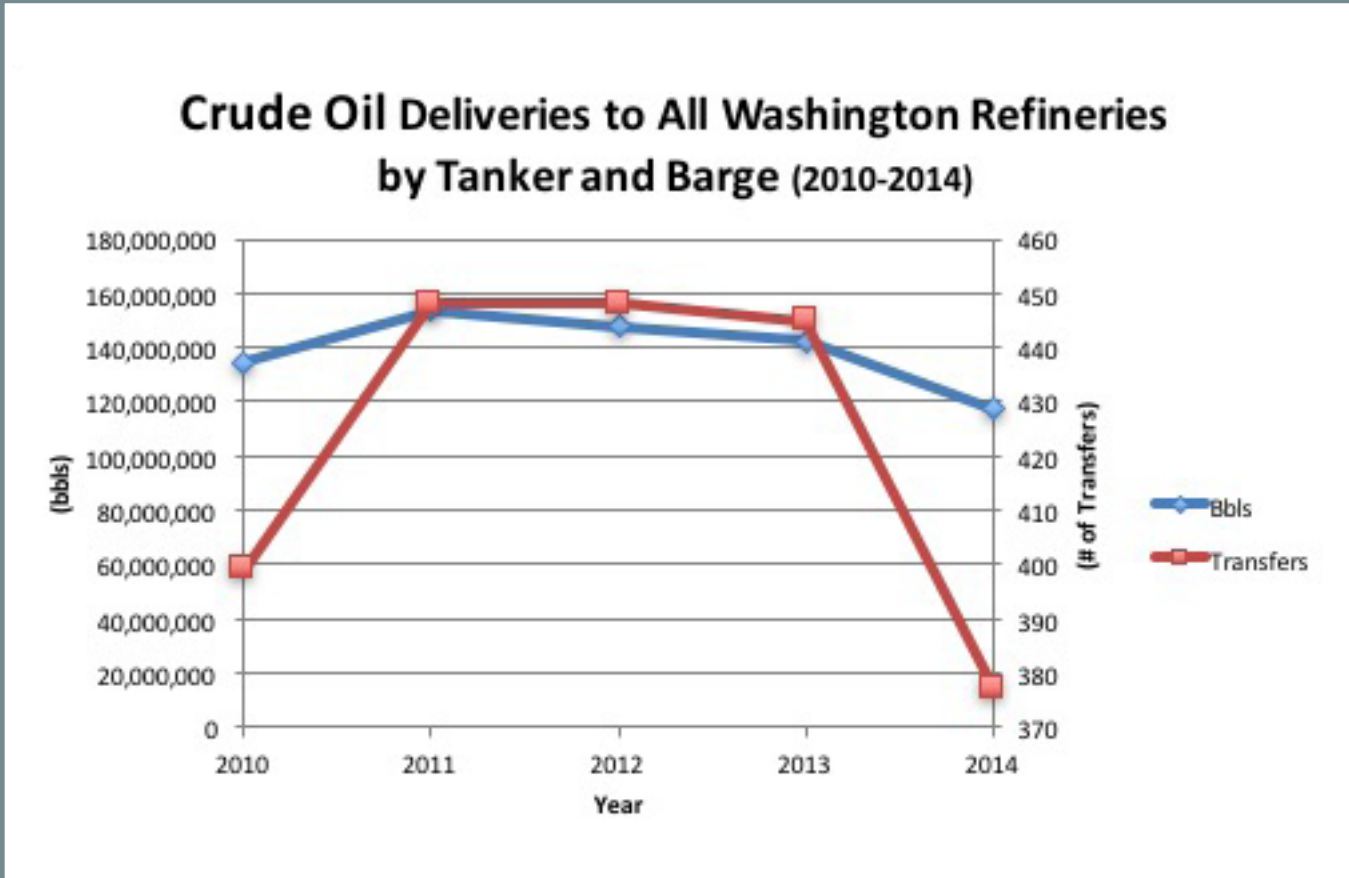
Additional capacity is provided by the Puget Sound Pipeline that connects the Trans Mountain Pipeline to the four North Sound refineries. There have been discussions about further increasing the capacity of that pipeline from 180,000 bbls per day to 225,000 bbls per day.³²

From a risk perspective, (frequency x consequence), despite a decrease in the volume of crude oil deliveries to the refineries over the water, the increase in number of ATB transits and transfers has increased the potential for a spill. Furthermore, the use of refineries as marine terminals to ship crude oil outbound that arrives by rail or pipeline further increases risk (see Exports, p. 39).

Changes in the sources of crude and refined products (also imported) delivered to the refineries are subject to the wide swings in the price of oil, long term contract obligations and the availability of excess stock making future risk projections challenging.

Crude Oil Delivered to Washington Refineries (2010-2014)

Figure 7



Volume and Frequency of Crude Oil Deliveries to Washington Refineries by Tanker and Barge (2010-2014)

Figure 7 depicts both the volume and frequency of all crude oils delivered to Washington refineries by tanker and barge between 2010-2014.

Between 2010-2014 a total of 695,797,688 barrels of crude oil was delivered during 2,117 transfers. The volume of crude oil delivered to Washington refineries by water decreased by 13% from 134,425,264 bbls in 2011 to 117,363,882 bbls in 2014. This was associated with a 5% reduction in the number of crude oil deliveries from 399 to 377 over the same time period.

The crude oil trend differs from that exhibited by the volume and frequency of total amount of oil delivered to refineries by barges and tankers. Both the volume of crude oil (-13%) and the number of crude oil deliveries (-5 %)

decreased during this time (Figure 7). However the volume of all oil deliveries only decreased by 5% while the number of deliveries increased by 29% (Figure 6).

The difference in trends between crude oil alone and the combined deliveries of all oil types can be explained by the fact that the expansion of the Puget Sound Pipeline and onset of crude by rail (CBR) during this time impacted crude oil deliveries only. Therefore, both the volume and number of crude oil deliveries decreased while the advent of ATBs resulted in an increase in the number of total oil deliveries despite there being a reduction in the volume of oil transferred.



Crude Oil Delivered to the U.S. Oil Refinery (2010-2014)

US Oil is the smallest refinery in Washington State with a capacity of only 42,000 bbls/day³³ and it is the primary recipient of dilbit crude by barge in the Salish Sea.³⁴

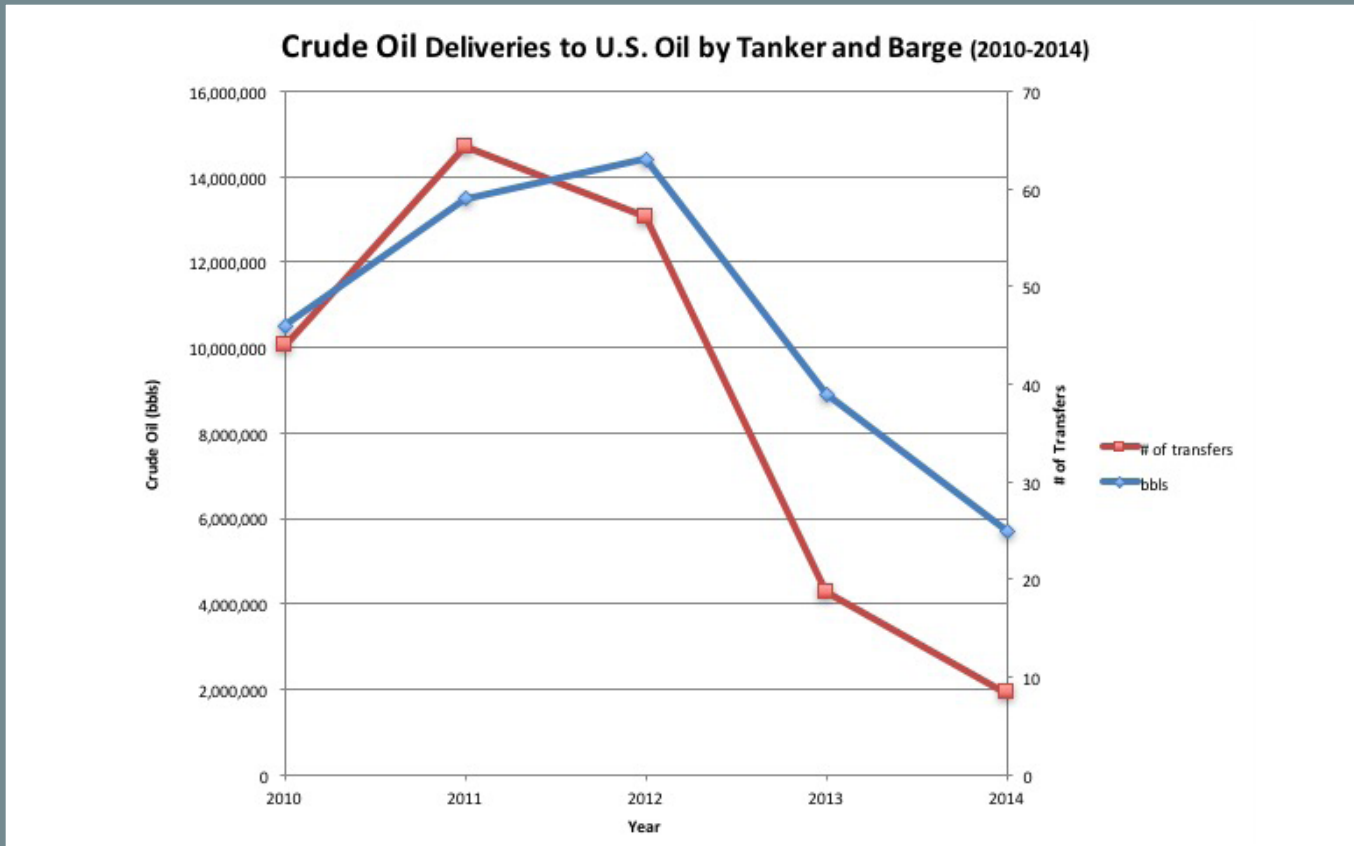


Figure 8

Volume and Frequency of Crude Oil Deliveries by Tanker and Barge to U.S. Oil Refinery (2010-2014)

Figure 8 depicts both the volume and frequency of crude oil delivered to the U.S. Oil refinery by barge and tanker between 2010-2014.

Between 2010-2014 US Oil received 44,231,508 bbls (233 delivered) of all types of crude oil by water. These deliveries declined from 10,038,000 bbls in 2010 (46 deliveries) to 1,916,598 bbls (25 deliveries) in 2014. This amounts to an 81% overall reduction in the volume of crude oil delivered and a 46% reduction in the number of deliveries. From 2010 to the peak of 14,686,697 in

2011, crude oil deliveries increased by 32%. From the 2011 high to 2014 there was an 87% reduction. The fact that the frequency paralleled the volume of deliveries indicates the size of vessels remained constant.

For the refinery to run at full capacity, the balance of the crude oil had to be obtained from other sources that were delivered by rail since the refinery is not connected to the Puget Sound Pipeline like the North Sound refineries.

The expansion of the CBR terminal at U.S. Oil was reportedly completed in April 2013 with more than enough capacity (48,000 bbls/day) to serve all the refinery's crude oil volume needs. This coincides with the initiation of crude exports (see Exports, p. 39). However, the refinery not only needs to have enough crude, it needs to have the right composition of crude to match what the refinery is engineered to process. This is reflected in the proportion of dilbit crude it continued to receive (Figure 10).



Dilbit Crude Deliveries to the U.S. Oil Refinery (2010-2014)

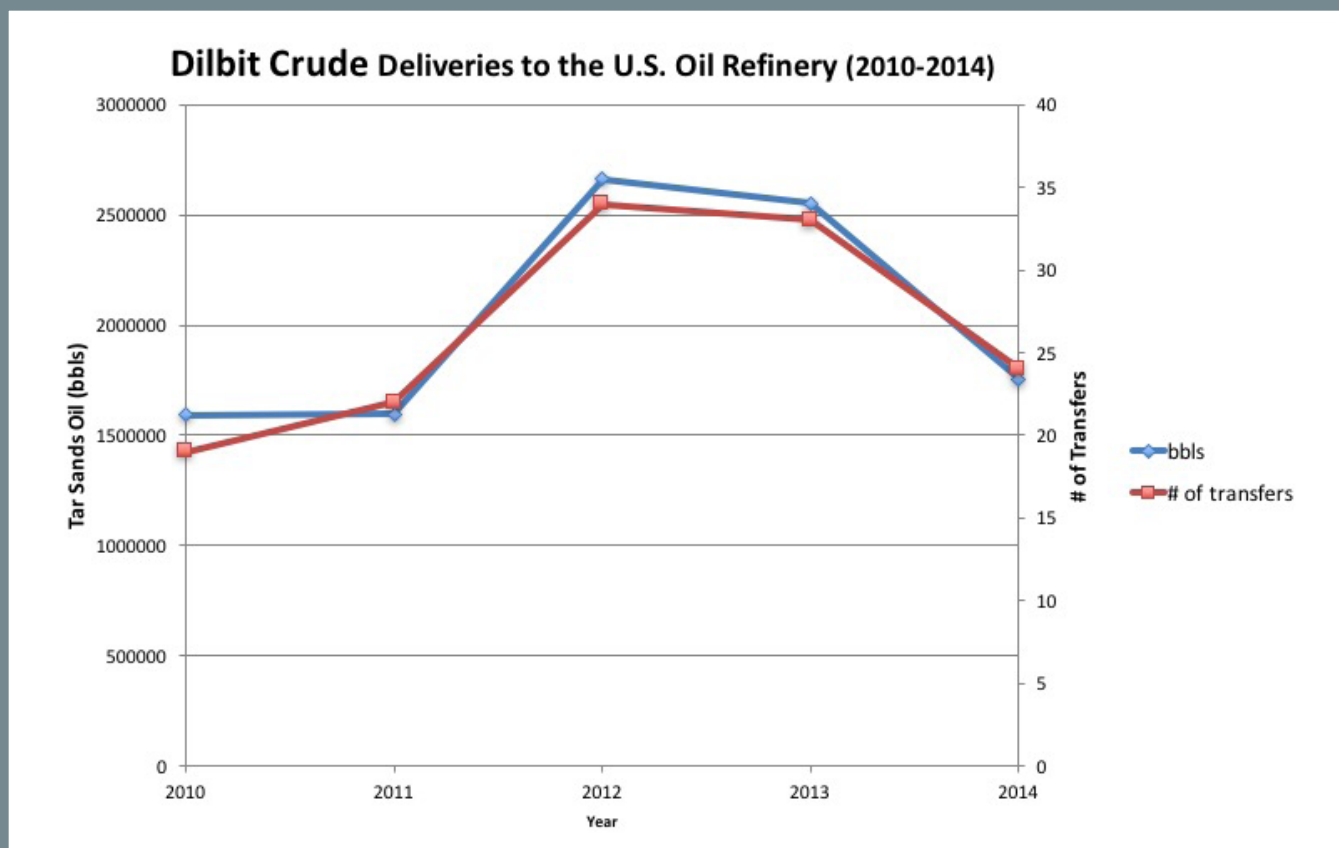


Figure 9

Volume and Frequency of Dilbit Crude Oil Deliveries by Barge to the U.S. Oil Refinery (2010-2014)

Figure 9 depicts both the volume and frequency of dilbit crude oil delivered to the U.S. Oil refinery by barge between 2010-2014.

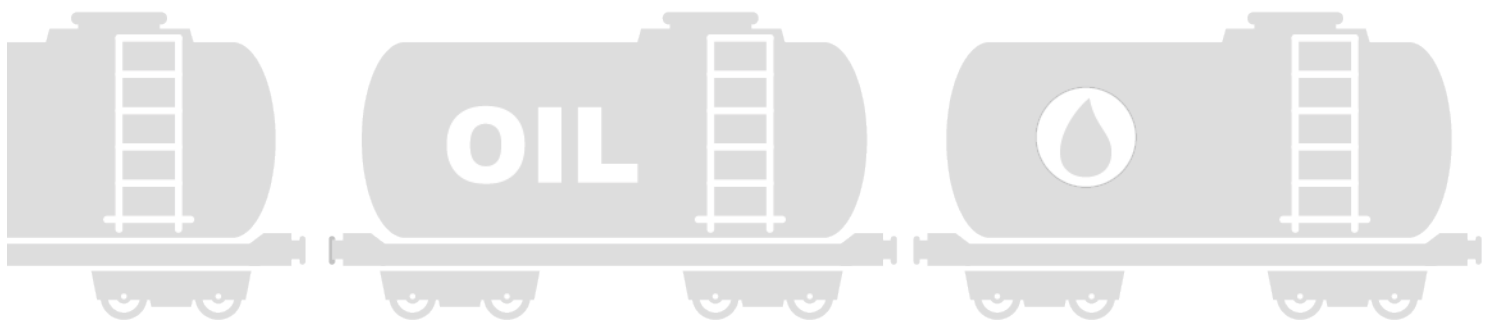
This paper only evaluates the dilbit crude oil that was delivered to the U.S. Oil refinery by Sause Brothers owned barges - Commencement Bay and Drakes Bay - between 2010 and 2014. Tankers could have also made deliveries but their cargo was unable to be tracked from the data that was collected.

Sause Brothers barges delivered a total of 10,156,553 bbls of dilbit crude oil during 132 deliveries to the U.S. Oil refinery between 2010-2014.

The volume of dilbit crude increased 9% over this period. However, from 2010 to the peak in 2012, (2,663,970 bbls), volumes of oil delivered increased by 34%. By 2014 the volume of dilbit crude delivered was reduced to 1,754,098.

The number of dilbit crude deliveries increased by 21% (from 19 to 24) between 2010-2014. Upon closer inspection, between 2010 (19 deliveries) and the high in 2012 (34 deliveries) there was a 44% increase, followed by a 29% reduction by 2014.

The reduction in dilbit crude volumes and deliveries in 2013 corresponds to the sharp increase in crude oil exports (see Exports, p. 39). However, by 2014 the frequency and volume of oil delivered was still higher than in 2010. The fact that the change in the number of deliveries paralleled the volume delivered suggests that, like the number for all crude sources (Figure 8) the size of the vessels serving the refinery did not change significantly.



Proportion of **Dilbit Crude** Deliveries Relative to All Crude Oil Delivered to the U.S. Oil Refinery (2010-2014)

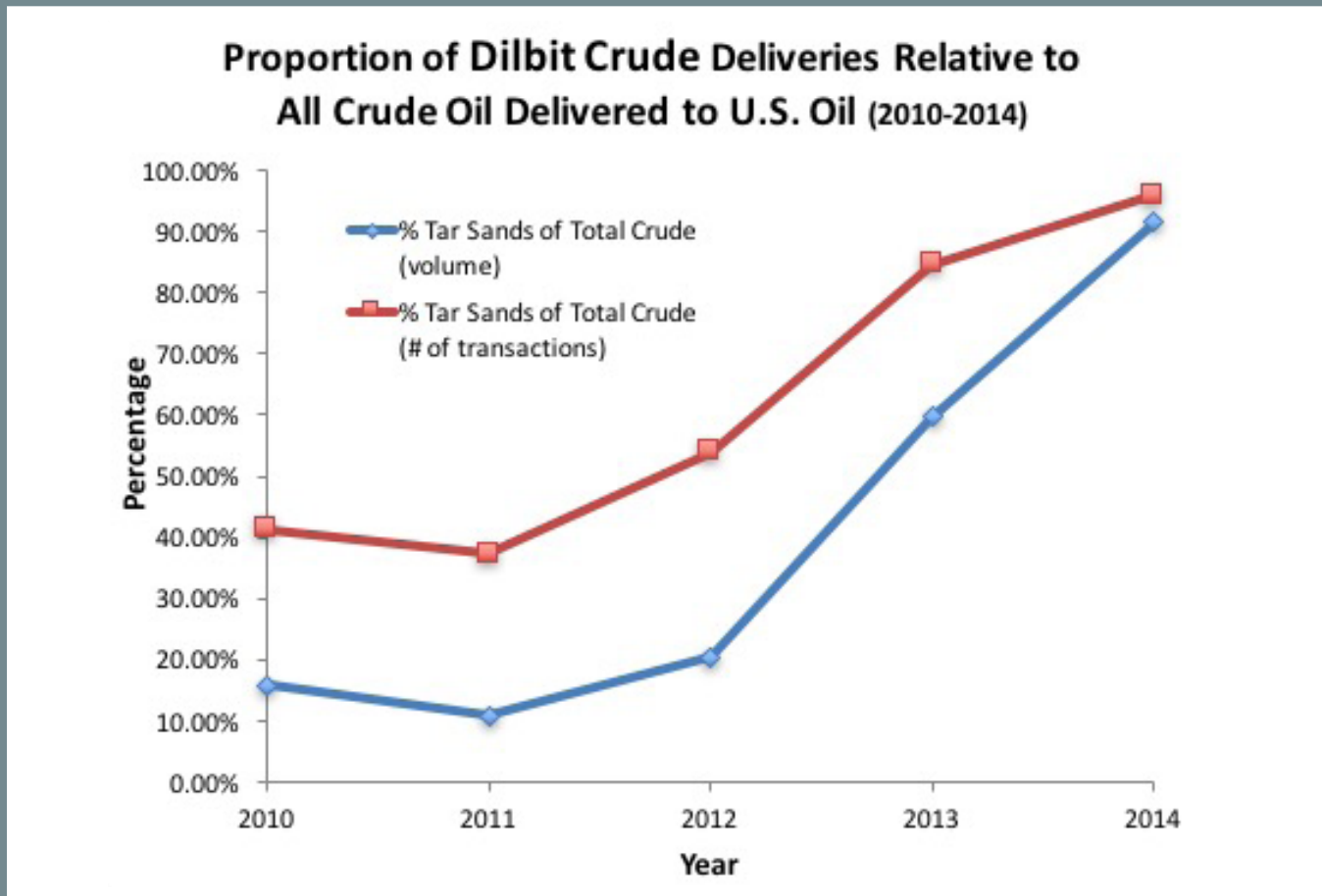


Figure 10

Volume and Frequency of Dilbit Crude Oil Deliveries Relative to All Crude Oil Delivered to the U.S. Oil Refinery (2010-2014)

Figure 10 depicts the volume and frequency of dilbit crude oil delivered to the U.S. Oil refinery relative to all crude oil received between 2010-2014.

Between 2010 and 2014 Sause Brothers dilbit crude oil barges delivered 23% of the volume of oil (10,156,553 of 44,231,508 barrels) and made 57% of the deliveries (132 of 233) of all the crude oil delivered to the U.S. Oil refinery. The volume of dilbit crude received as a percentage of the total crude received by ship increased from 16% in 2010 to 92% in 2014. The number of dilbit deliveries

as percentage of all crude delivered increased from 41% in 2010 to 96% in 2014. The rate of this relative increase corresponds with the expanded operation of the crude by rail (CBR) terminal that likely provided increasing volumes of crude oil derived from North Dakota Bakken shale. CBR has a larger impact on US Oil than other refineries due to the fact that US Oil is not connected to the Puget Sound crude oil pipeline.

The relative number of dilbit crude deliveries as compared to the volume of other crude oil deliveries is likely because other crudes were delivered on tankers from more distant sources that enabled higher volumes to be delivered per transfer.

While there was a significant reduction in the total amount of crude oil delivered by ship to the U.S. Oil refinery, the volume of dilbit crude increased by 9% (Figure 9). By 2014 dilbit crude had become the primary source of crude oil deliveries at US Oil (Figure 10).

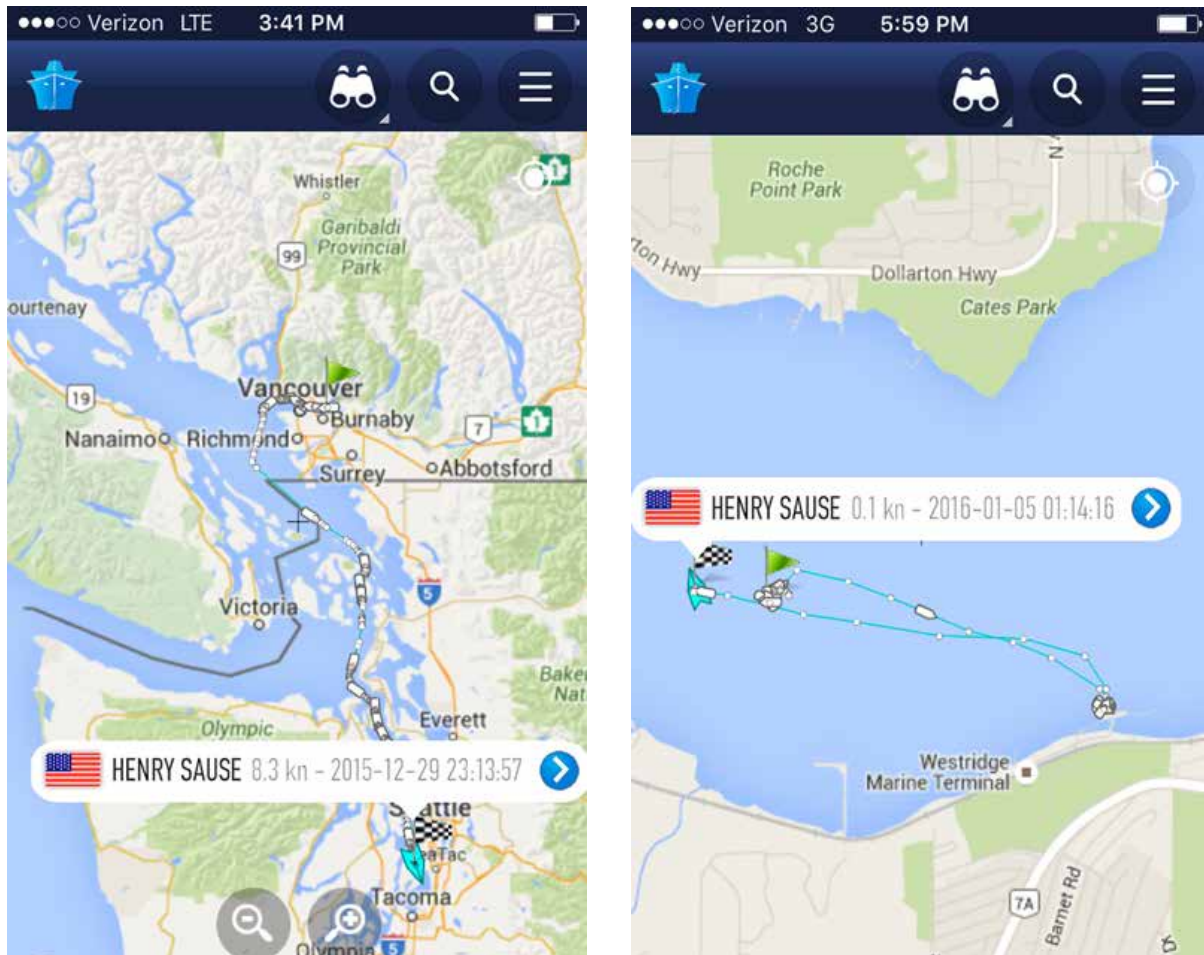
Therefore, despite the reduction in the total volume of crude oil delivered by ship to the U.S. Oil refinery, the exposure of Washington's waters to a dilbit crude oil spill has increased.

The expansion of crude oil exports over this period further increases the risk of oil spills. Following the opening of the CBR terminal in 2014, US Oil exported 145,000 barrels of crude oil for the first time during the study period. This documents that there can be and was a surplus of crude oil entering the facility (see Exports, p. 39). The term export is used to describe the use of a refinery dock as a marine terminal, bypassing the refinery to ship crude oil outbound. The Salish Sea is exposed to the same oil spill risk whether the tanker is bound to a U.S. or foreign port. While the destination of the tanker is not known, outbound shipment of crude oil is referred to as exports.



Route of Dilbit Crude Barges through the Salish Sea

Figure 11



Tug Henry Sause Transit: Burnaby, BC to Tacoma, WA

Figure 11 Route of tug boat Henry Sause, towing the barge Commencement Bay, between the U.S. Oil refinery in Tacoma, Washington and the Trans Mountain oil terminal in Burnaby, British Columbia (12/29/15-1/5/16).

The only way to characterize the movements of dilbit crude oil through the Salish Sea is by knowing both the name of the tug and barge engaged in this trade. The name of barge is listed in the State's ANT database as the ship engaged in the delivery of the oil to and from the refinery. The name of the tug towing the barge is needed in order to confirm the source of the crude as

originating from the Westridge terminal as well as the route taken to and from the U.S. Oil refinery (Figure 11).

As previously stated, barges are not required to carry Automatic Identification System (AIS) tracking devices. The movements of dilbit crude oil through the Salish Sea were only able to be tracked once it was determined the barges Drakes Bay and Commencement Bay were towed by the tug Henry Sause. The track lines were followed for several weeks utilizing the Marine Traffic mobile phone application.³⁵ A more complete history of the tug's movements was researched through a more robust online application.

Figure 11 shows two screen shots from a cell phone of the Henry Sause. It clearly documents the use of Rosario Strait as the route taken between the Burnaby, BC terminal and the U.S. Oil refinery. It also shows there are many movements, to and from an anchorage once the tug and tow arrives at the Westridge marine terminal.

Appendix 5 lists the movements of the Henry Sause recorded by Marine Traffic between December 12, 2015 and February 8, 2016. It made seven trips during this time. Based on these data, once the tug and tow get underway, it took approximately 20 hours for the trip. In addition, it made two trips to San Francisco after leaving the U.S. Oil refinery. It is not clear what oil products were transported to and from that destination.

Rosario Strait is also the primary route taken by tankers, ATBs and other oil barges to and from the four North Sound refineries. This is also the narrowest waterway these vessels transit. While there have been a variety of geographically specific regulations applied to tankers in this waterway, they do not apply to barges or ATBs.



Crude Oil “Exports”

In anticipation of the passage of legislation lifting the 40-year old ban on the export of domestically produced crude oil in 2015, we set out to determine if the existing refinery tanker docks could bypass the refinery to serve as export terminals. Documenting this activity serves to verify that the existing piping would allow this activity in the future.

There is little evidence of crude oil being shipped overseas through Washington waters in what is traditionally thought of as export. From a risk management perspective it does not matter the destination of the outbound ship, only that laden tankers are plying Washington waters both inbound and outbound.

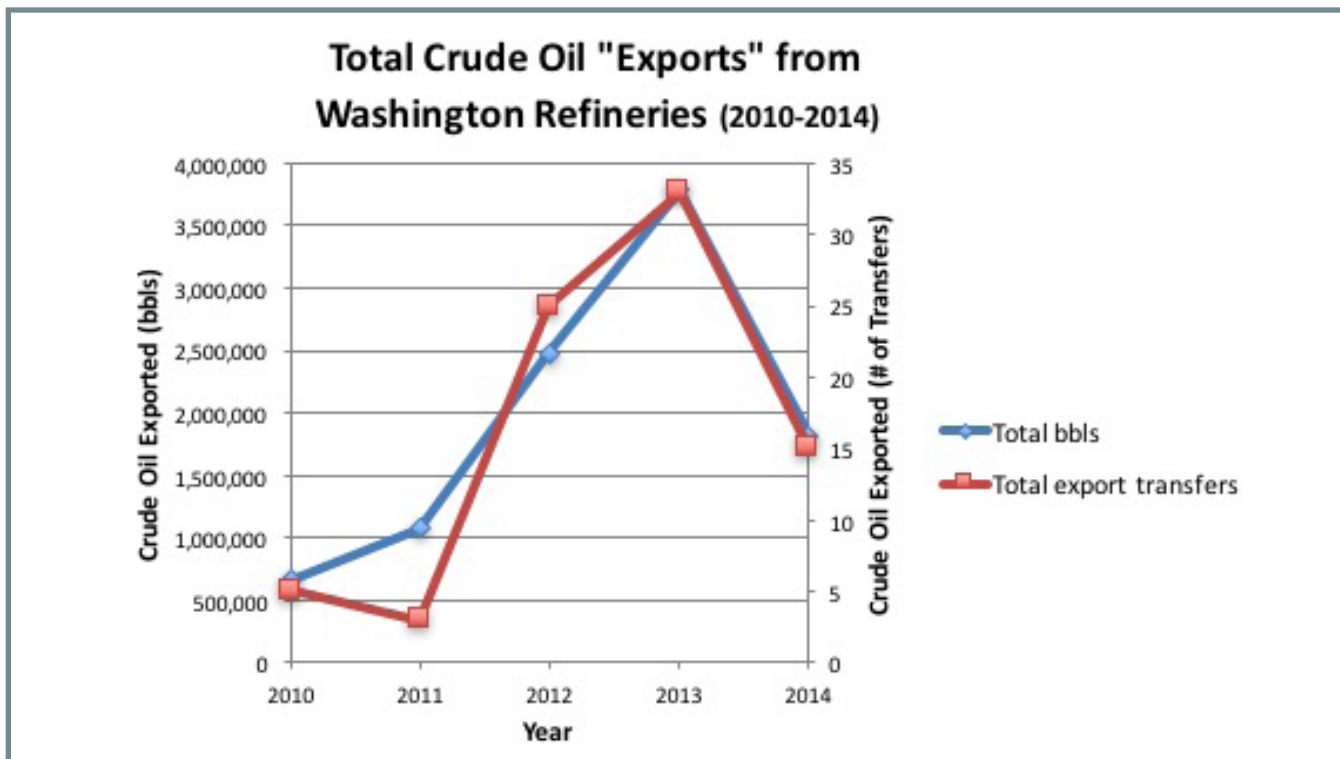
The importance of knowing this is because the State’s analysis of the decreases in crude oil tankers plying Washington waters only considers the number of tankers entering the State, not those outbound. The onset of tankers leaving while laden with crude roughly coincides with the beginning of operations of crude by rail terminals at Washington refineries.

Each 100-car crude oil unit train holds as much as 2.9 million gallons of crude oil. It takes two to three unit trains to fill an ATB or about 12 to 13 unit trains per Aframax tanker. Existing CBR capacities are presented below. Targa Sound Terminal is currently just used as an oil storage facility.

Existing Crude by Rail (CBR) facilities:³⁶

Tesoro Anacortes	75,000 bbls/day	September 2012
BP Cherry Point	146,000 bbls/day	December 2012
US Oil	48,000 bbls/day	April 2013 (expansion 2014)
Phillips 66	75,000 bbls/day	November 2014
Targa	75,000 bbls/day	(2014 expansion)
Shell Anacortes	*75,000 bbls/day	*Approval pending EIS completion
<hr/>		
New Capacity	419,000 bbls/day	Total Capacity 476,190

When operating at full capacity the crude by rail terminals located within the Salish Sea can handle a total of 476,190 bbls/day. This does not include the 75,000 bbls/day proposed for the Shell Refinery in Anacortes. Washington’s five refineries can process 619,047 bbls/day (Figure 2). The 140,000 bbls/day difference between the CBR capacity and refinery demand for crude is equivalent to the capacity of Shell Refinery in Anacortes.



Total Crude Oil “Exports” from Washington Refineries (2010-2014)

Figure 12 depicts the frequency and volume of crude oil exports from Washington refineries between 2010-2014.

The frequency and volume of crude oil exports in figure 12:

5 times in 2010	662,000 bbls	no CBR
3 times in 2011	1,070,000 bbls	no CBR
24 times in 2012	2,477,200 bbls	Nov - US Oil, Tesoro
33 times in 2013	3,786,000 bbls	US Oil & Tesoro CBR + PS Pipeline expansion
15 times in 2014	1,815,000 bbls	Jan - BP, Nov - Phillips 66
80	9,810,200 bbls	

(Source: Ecology ANT data)

Washington refineries exported 9,810,200 barrels of crude oil on 80 occasions between 2010-2014. Starting in 2012 there was a significant increase in the frequency and volume of crude oil exports. This activity coincided with the completion of the US Oil and Tesoro Refinery CBR terminals. The correspondence of the frequency and volume of oil deliveries indicates a consistent size of vessel used during this period.

There was a peak in exports in 2013 corresponding to the first full year in which the US Oil and Tesoro CBR terminals were in operation. In addition an expansion of the Puget Sound Pipeline was completed thereby increasing the access North Sound refineries have to the vast reserves of dilbit from the Alberta tar sands. This underscores the flexibility of refinery operations to meet future demands for crude oil.

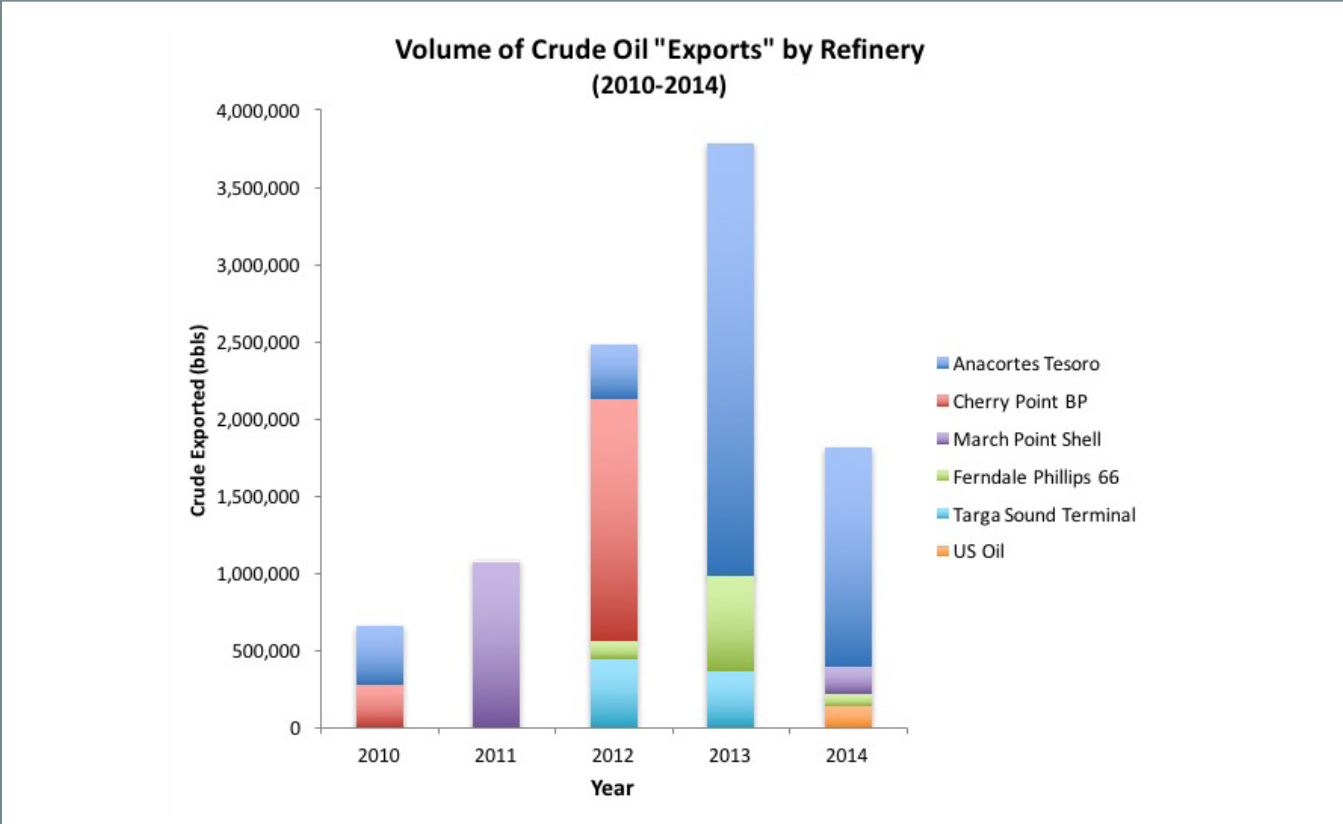


Figure 13

Volume of Crude Oil “Exports” by Refinery (2010-2014)

Crude Oil Exports from Washington State Refineries

The frequency and volume of crude oil exports in figure 13:

Tesoro	28	4,949,000 bbls
BP	10	1,840,000 bbls
Phillips 66	14	820,000 bbls
Shell	4	1,245,000 bbls
Targa	20	811,000 bbls
US Oil	4	145,000 bbls

Total: 80 9,810,000 bbls

(Souce: Ecology ANT

Between 2010-2014 all five refineries in Washington State and the Targa Sound Terminal in Tacoma, Washington exported crude oil. While these data do not represent a significant amount of crude oil exports, it demonstrates the capacity to meet future market demands without modifying the existing terminals.

During this time Tesoro exported by far the most crude oil. This activity began with the completion of its CBR terminal in 2012. US Oil exported the least amount of crude oil and that export only occurred in 2014. Interestingly, Shell Oil exported crude in 2011 and 2014 without access to a CBR terminal. This can be explained by their connection to the Puget Sound Pipeline.

*Crude Oil
"Exported"
from U.S. Oil
Refinery
(2010-2014)*

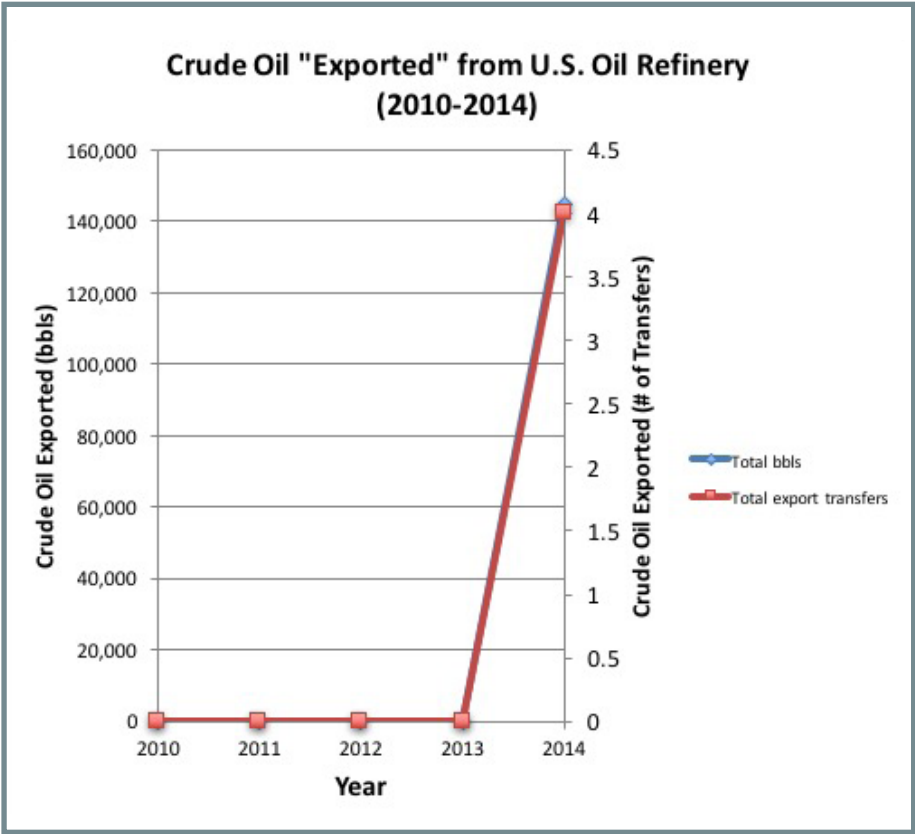


Figure 14

Figure 14 Between 2013-2014 the U.S. Oil refinery exported 145,000 barrels of crude oil. This amounted to 1.5% of all the crude oil exported by refineries in Washington State. The exports occurred over 4 transactions after completing a 2.02 mgal/day CBR terminal in 2014.

The destination of the exports is not known. Future research could investigate the name of the vessels used in this trade to track the movements of the outbound crude.

*Crude Oil
"Exported"
from
Tesoro
Refinery
(2010-2014)*

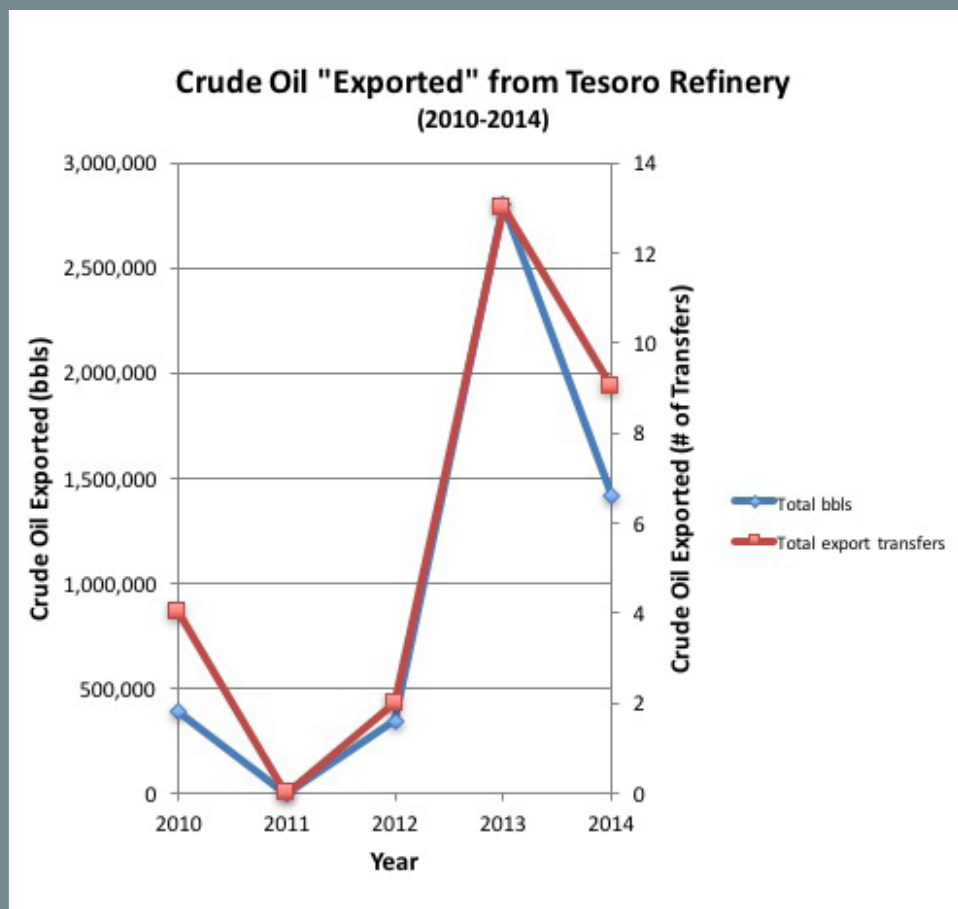


Figure 15 Between 2010 and 2014 Tesoro exported 4,949,000 bbls of crude oil during 24 transfers. This was by far the most crude oil exported of all the refineries in Washington State. Tesoro's exports comprised 35% of the transactions and 50% of the total volume exported. The significant portion of this trend began after the completion of its 3.15 mgal/day CBR facility in September 2012.

Tesoro was the first refinery in Washington State to build a CBR terminal. The reason for this may be explained by the fact that Tesoro does not own a share of North Slope crude like the other North Sound refineries. Therefore, they were likely motivated to take advantage of the recently emerging supplies of shale oil produced in North Dakota from the Bakken formations.

The potential reason for the initiation of exports was to supply its refinery in Cook Inlet, Alaska.³⁷ Despite being further away, the cheaper cost of the Bakken crude could compensate for the additional transportation costs. Future research could verify this trend.

(2010-2014)

Summary of Oil Deliveries within the Salish Sea

- (1)** Washington State is a major oil refinery center - tankers and barges made 9,316 deliveries totaling 866,338,352 bbls of oil. (Figure 6)
- (2)** While the volume of oil Washington refineries received declined by 5%, the number of deliveries increased by 29% thereby increasing the risk of an oil spill due to the increasing use of barges and ATBs. (Figure 6)
- (3)** Washington refineries received 2,117 deliveries totaling 695,797,688 barrels of crude oil. (Figure 7)
- (4)** The volume of crude oil delivered to Washington refineries by water decreased by 13% (134,425,264 bbls in 2011 to 117,363,882 bbls in 2014). (Figure 7)
- (5)** The U.S. Oil refinery is the primary destination for waterborne deliveries of dilbit crude oil in Washington State.
- (6)** The U.S. Oil refinery received 233 deliveries totaling 44,231,508 bbls of all types of crude oil. (Figure 8)
- (7)** The volume of crude oil deliveries by ship to the U.S. Oil refinery declined 81% (10,038,000 bbls in 2010 to 1,916,598 bbls) and there was a 46% reduction in deliveries (46 to 25). (Figure 8)
- (8)** The primary source of dilbit is delivered to US Oil by the tug Henry Sause towing the barges Drakes Bay and Commencement Bay from the Kinder Morgan oil terminal in Burnaby, BC via Rosario Strait. (Figure 11, Appendix 5)
- (9)** The U.S. Oil refinery received 132 deliveries of dilbit crude oil for a total of 10,156,553 bbls. (Figure 9)

- (10)** The volume of dilbit crude oil deliveries to US Oil increased by 9%, (1,592,000 to 1,754,098). There was a peak of 2,663,970 bbls of dilbit crude oil delivered in 2012. The number of dilbit crude oil deliveries increased by 21% (19 to 24) with a peak of 34 in 2012. (Figure 9)
- (11)** The volume of dilbit crude US Oil received as a percentage of the total crude received by ship increased from 16% in 2010 to 92% in 2014. The number of dilbit deliveries as percentage of all crude transfers increased from 41% in 2010 to 96% in 2014. (Figure 10)
- (12)** The increasing percentage of dilbit deliveries to US Oil corresponded with the use of its crude by rail terminal (CBR).
- (13)** Washington refineries used their docks to export crude oil on tankers 80 times for a total of 9,810,200 bbls. (Figure 12)
- (14)** All five refineries demonstrated the ability to use their refinery docks as crude export terminals. (Figure 13)
- (15)** US Oil exported the least amount of crude oil (145,000 bbls) (Figure 14). Tesoro exported the most crude oil (4,949,000 bbls). (Figure 13)
- (16)** The onset of crude exports closely coincides with construction of CBR terminals. (Figure 12)

RECOMMENDATIONS:

1. Establish tug escort requirements for oil barges and ATBs, especially those transporting dilbit, as required in San Francisco Bay.³⁸
2. Update the Washington State Contingency Plan to address the unique challenges of responding to a dilbit crude oil spill documented by the National Academy of Sciences.³⁹ This should include:
 - a. Faster response requirements enabling oil spill responders to recover dilbit crude oil spills prior to sinking.
 - b. Stockpile specialized equipment in Rosario and Haro Straits.
 - c. Conduct no-notice, equipment deployment drills to verify response capacity and make results available to the public.
3. Station an Emergency Response Towing Vessel in the San Juan Islands to prevent spills, especially of dilbit crude oil.
4. Introduce state legislation requiring expanded Advance Notice of Transfer (ANT) reporting requirements that include:
 - a. Type of crude oil being transferred for spill preparedness.
 - b. Name of tug towing barge, and if it is laden, for tracking movements.
 - c. Destination of outbound crude to monitor impact of exports.

NDATIONS

Recommendations:

5. Introduce federal legislation to address further data needs including:
 - a. Require tugs to update their AIS signal to indicate whether or not they are towing a barge and if it is laden.
 - b. Require consistent classification of commercial vessel types datasets created by the Coast Guard in the United States and Canada to facilitate future analysis.
6. Petition Congress to seek clarification from the U.S. Coast Guard if vessels bound to Canada are subject to U.S. regulations or if they are granted “innocent passage.”
7. Use these findings to elevate public awareness of and opposition to the expansion of the Trans Mountain Pipeline and its 7-fold increase in dilbit crude oil tankers.
8. Petition the U.S. Coast Guard to require inert gas systems on barges carrying volatile oil as is required for oil tankers to prevent explosions.
9. Re-establish the Sea Use Council, created in 1969, to facilitate dialogue on marine issues between the United States and Canada in the Northwest.
10. Repeat this study on a regular basis to evaluate how variations in the price of oil affect the way in which oil is moved through the region.

CONCLUSION

There have been few large oil spills in the Salish Sea - a nationally enviable record and a testament to the countless efforts of local, state, federal and tribal governments, industry and environmental advocacy.

It is hoped that these recommendations serve to prevent the biggest underlying threat of an oil spill - complacency.

By characterizing the existing movements of dilbit crude oil within the Salish Sea this paper enables the public to call on decision makers to enhance the ability to prevent and respond to spills of dilbit crude oil.

This paper also makes it clear that all five of Washington's refineries have the ability to serve as crude oil export terminals. The degree to which this practice is exercised is critical to monitor now that Congress has lifted the ban on domestic crude oil exports.

It is also hoped that this paper brings added public attention to the potentially significant increase in the Salish Sea's exposure to a spill of dilbit crude oil if expansion of the Trans Mountain Pipeline is approved.

The dynamic nature of the oil trade makes it difficult to define long-term trends as the price and sources of crude oil rapidly fluctuate. Therefore, it is important to update this analysis on a regular basis. For example, based on the extremely low price of crude oil during much of 2015, it is likely that a high volume of oil was transported by rail. It is expected that this will result in an unrepresentatively low number of waterborne deliveries as compared to the analysis presented in this study.

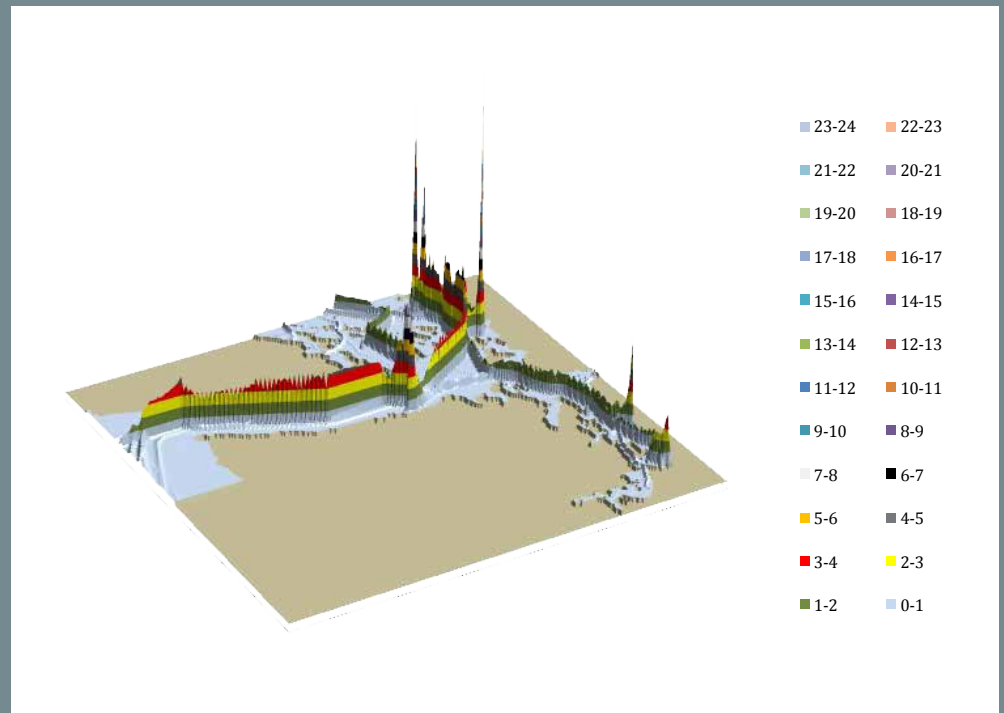


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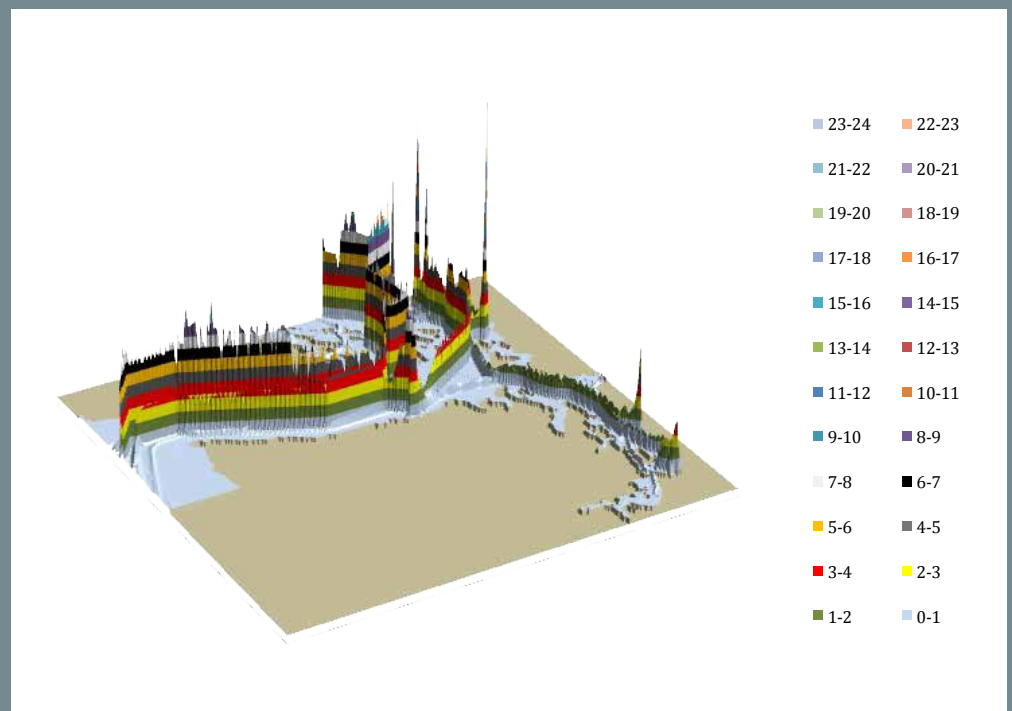
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- 2013** Emerging Risks Report <http://rrt10nwac.com/Files/FactSheets/131217071637.pdf>.
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- 2016** Pipeline expansion plan raises worries about oil spills KIRO TV7. 3/1/2016. <http://www.kiro7.com/news/are-canadians-prepared-to-handle-oil-spills/135104793>.
- 1997** (rev. March 2007) Oil Spills in Washington State: A Historical Analysis. Publication No. 97-252 <https://fortress.wa.gov/ecy/publications/documents/97252.pdf>.

Appendix 1

2010 Vessel Traffic Risk Assessment



Commercial vessel traffic density and distribution in the Salish Sea in 2010 (upper) compared to the addition of 348 tankers associated with the Kinder Morgan proposed pipeline expansion (lower).



2014. VanDorp, Rene and Jason Merrik. Vessel Traffic Risk Assessment 2010 serves as a detailed information source for all. <http://www.seas.gwu.edu/~dorpjr/VTRA/PSP/CASES/VTRA%202010%20FACTOR%207.pdf>

FOIA Request #2014-1938

Description of Seven Incidents

INCIDENT DATA:

.....

Henry Brusco Oct 10, 2011	• Barge: Contaminated general cargo (24 containers had mixed DOD ammunitions and explosives)
Pacific Eagle Oct 26, 2011	• Barge: Oil
Pacific Eagle Nov 21, 2011	• Barge: Oil
Pacific Eagle Dec 8, 2011	• Barge: Oil
Nancy M Dec 23, 2011	• Barge: Two Derrick barges
Pacific Eagle May 23, 2013	• Barge: Oil
Red Bluff Sep 8, 2013	• Towing disabled fishing processor vessel

Appendix 3
July 2015
Harbor Safety
Plan Puget
Sound -
Rosario
Towing
Operations

Harbor Safety Plan Puget Sound p.97-98
July 2015 Harbor Safety Committee
Updated/Revised July 2015

A. GENERAL INFORMATION

1. This Standard of Care alerts towing vessel owners and operators to the dangers associated with transiting Rosario Strait, and establishes good marine practice to mitigate associated safety risks to minimize the possibility of a vessel casualty.

2. Rosario Strait is a narrow waterway connecting the Strait of Georgia and the Inland Passage of British Columbia with the Strait of Juan de Fuca. Rosario Strait passes through the eastern San Juan Island archipelago, is part of the larger Eastern San Juan Island VTS Special Area, and is defined in 33 CFR 161.55(b). An International Maritime Organization (IMO) designated one lane Traffic Separation Scheme (TSS) with no separation zone traverses Rosario Strait. Rosario Strait experiences substantial tidal currents and has numerous hazards to navigation.

3. According to NOAA Pacific Coast Tidal Current Tables, tidal currents ebb to the south in Rosario Strait. Tidal currents in Guemes Channel strongly ebb to the west at a higher speed ratio compared to Rosario Strait with the current changing to ebb 90 minutes prior to the currents in Rosario Strait. Guemes Channel is oriented east/west and connects Rosario Strait with the Anacortes-March Point area. Based on geography, Rosario Strait can be affected by ebbing tidal currents from Guemes Channel. As chart editions are updated, NOAA will incorporate the addition of a cautionary note to applicable nautical charts of Rosario Strait to highlight the danger to mariners.

4. USCG VTS Puget Sound has observed a trend for tugs and tows transiting north or southbound in Rosario Strait to be set to the west, particularly in the southern portions of Rosario Strait where several navigational hazards exist just to the west outside the traffic lane. VTS Puget Sound will continue to employ electronic visual alarm zones within Rosario Strait to alert Vessel Traffic Management Specialists when a vessel may be departing the traffic lane and standing into potential danger so that a timely and relevant marine traffic advisory can be provided to help avert a marine casualty.

5. Nothing in this Standard of Care relinquishes the vessel owner or operator from any of the requirements regarding vessel safety and the protection of the environment specified in the applicable sections of 46 CFR “Shipping” and 33 CFR “Navigation,” or the International Regulations for Prevention of Collisions at Sea, 1972 (72 COLREGS). ACTION: It is crucial that towing vessel owners and operators remain cognizant of the challenges associated with transiting Rosario Strait, convey this information in company operating manuals, take extra precautions to ensure vigilant watch standing practices, and consider augmenting bridge watch manning while transiting this environmentally sensitive waterway as a measure to mitigate risk.

B. SPECIFIC STANDARD OF CARE

1. This Standard of Care is applicable to all towing vessel transits (not light tugs without a tow) through Rosario Strait regardless of the time of day or tidal state, weather conditions, or visibility.

a. Towing vessels are encouraged to transit the middle of the single traffic lane, except when meeting another vessel or to comply with the VTS Special Area regulations not to impede the passage of a vessel of 40,000 dead weight tons or more.

b. Towing vessels are to call USCG VTS Puget Sound on channel 05A at a Calling In Point when southbound in Rosario Strait. This Calling In Point will be at 48° 35’ 00”N, when abeam Tide Point. This Calling In Point will place emphasis on the importance of watchstander vigilance and provide an opportunity for USCG VTS to share appropriate vessel traffic and/or hydrological information.

2. Additional VTS Special Area regulations for towing vessels in Rosario Strait are restated below:

a. If towing astern, do so with as short a hawser as safety and good seamanship permits.

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b. Towing vessels shall not enter or get underway in the VTS Special Area if a hazardous vessel operating condition exists as defined in 33 CFR 161.2. Deviations may be granted only by the USCG Captain of the Port.

c. Before meeting, crossing, or overtaking any other Vessel Movement Reporting System User in the VTS Special Area, towing vessels shall communicate on the designated vessel bridge-to-bridge radiotelephone frequency their intended navigation movements and any other information necessary in order to make safe passing arrangements.



Washington State Department of Ecology's Planning Standards for Group 5 (sinking) Oils

1. Plan holders carrying, handling, storing, or transporting Group 5 Oils must have a contract with a PRC that maintains the resources and/or capabilities necessary to respond to a spill of Group 5 Oils. Such equipment shall include, but is not limited to, the following:

- a. Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column;
- b. Containment boom, sorbent boom, silt curtains, or other methods for containing the oil that may remain floating on the surface or to reduce spreading on the bottom;
- c. Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline;
- d. Equipment necessary to assess the impact of such discharges; and
- e. Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported.

2. The equipment must be capable of being on scene within twelve hours of spill notification.

[Statutory Authority: Chapters 88.46, 90.48, 90.56 RCW, and 2011c 122. 13-01-054 (Order 11-06), 173-182-324, filed 12/14/12, effective 1/14/13.]



Appendix 4 Washington State Administrative Code (WAC 173-182-324)

Appendix 5

Henry Sause Transits (12/12/15-2/8/16)

TIME(UTC)	MOVE TYPE	PORT	UNLOCODE	VESSEL NAME
2016-02-08 11:52	ARRIVAL	MARTINEZ	USMRZ	HENRY SAUSE
2016-02-02 06:57	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2016-01-30 22:07	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2016-01-30 02:15	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-30 01:41	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-30 01:33	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-30 00:05	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-29 13:44	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-29 10:12	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-29 10:05	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-29 09:28	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-28 15:59	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2016-01-28 15:59	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2016-01-27 03:59	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-27 03:22	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-27 02:47	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-27 01:39	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-26 13:48	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-25 20:22	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-25 20:12	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-25 19:35	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-24 17:52	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2016-01-23 19:40	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2016-01-23 00:38	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-22 23:21	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-22 13:48	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-22 12:28	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-22 12:21	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-22 11:43	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-21 21:06	DEPARTURE	ANACORTES	USOTS	HENRY SAUSE
2016-01-15 04:38	ARRIVAL	ANACORTES	USOTS	HENRY SAUSE
2016-01-11 14:34	DEPARTURE	ANACORTES	USOTS	HENRY SAUSE
2016-01-11 14:15	ARRIVAL	ANACORTES	USOTS	HENRY SAUSE
2016-01-11 00:00	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2016-01-09 13:34	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2016-01-08 15:48	VANCOUVER	VANCOUVER	ANCH	HENRY SAUSE



Appendix 5

Henry Sause Transits (12/12/15-2/8/16)

TIME(UTC)	MOVE TYPE	PORT	UNLOCODE	VESSEL NAME
2016-01-08 15:14	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-08 15:10	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-08 00:31	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-07 13:43	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-07 12:17	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-07 12:11	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-07 11:35	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-06 19:36	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2016-01-06 01:00	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2016-01-05 06:55	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-05 05:40	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-05 05:32	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-05 00:05	ARRIVAL,	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-04 13:48	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-03 19:42	ARRIVAL,	VANCOUVER	CAVAN	HENRY SAUSE
2016-01-03 19:34	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2016-01-03 11:58	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2016-01-02 16:18	DEPARTURE	TACOMA	USTIW	HENRY SAUSE
2015-12-30 01:40	ARRIVAL	TACOMA	USTIW	HENRY SAUSE
2015-12-29 05:06	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2015-12-29 04:00	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2015-12-29 03:53	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2015-12-29 02:35	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2015-12-28 17:14	DEPARTURE	VANCOUVER	CAVAN	HENRY SAUSE
2015-12-28 08:55	ARRIVAL	VANCOUVER	CAVAN	HENRY SAUSE
2015-12-28 08:45	DEPARTURE	VANCOUVER	ANCH	HENRY SAUSE
2015-12-28 08:08	ARRIVAL	VANCOUVER	ANCH	HENRY SAUSE
2015-12-27 20:07	DEPARTURE	PORT ANGEL	USCLM	HENRY SAUSE
2015-12-25 01:29	ARRIVAL	PORT ANGEL	USCLM	HENRY SAUSE
2015-12-20 08:14	DEPARTURE	CHEVRON	SF	HENRY SAUSE
2015-12-19 04:06	ARRIVAL	CHEVRON	SF	HENRY SAUSE
2015-12-19 04:05	DEPARTURE	CHEVRON	SF	HENRY SAUSE
2015-12-19 03:16	ARRIVAL	CHEVRON	SF	HENRY SAUSE
2015-12-12 10:00	DEPARTURE	TACOMA	USTIW	HENRY SAUSE



Appendix 6⁴⁰

California Tank Vessel Escort Regulations for San Francisco Bay

TITLE 14, CALIFORNIA CODE OF REGULATIONS SUBDIVISION 4. OFFICE OF SPILL PREVENTION AND RESPONSE CHAPTER 4. VESSEL REQUIREMENTS SUBCHAPTER 1. TANK VESSEL ESCORT REGULATIONS FOR THE SAN FRANCISCO BAY REGION

SECTIONS 851.1 through 851.10.1

Amended September 15, 2006

Effective October 15, 2006

“851.2 Purpose and Scope”

This subchapter sets forth tank vessel escort requirements for the San Francisco, San Pablo and Suisun Bays. These requirements specify that tank vessels carrying 5,000 or more long tons of oil in bulk as cargo shall be escorted by a suitable escort tug or tugs.

“851.4 Applicability”

(a) This subchapter shall apply to all tank vessels capable of carrying 5,000 or more long tons of oil in bulk as cargo when these vessels are underway on waters in the San Francisco, San Pablo and Suisun Bays, as follows:

(1) tank vessels carrying 5,000 or more long tons of oil as cargo shall be required to comply with all the requirements in this subchapter;

(2) tank vessels carrying less than 5,000 long tons of oil as cargo shall only be required to comply with the reporting requirement as stated in Subsection 851.7

(b) The escort requirements of this subchapter shall not apply to tank vessels that are only shifting location within an anchorage. Any tug used during such a shifting maneuver need not be an escort tug registered with the Clearing House.

(c) This subchapter shall not apply to tank vessels otherwise covered by the requirements of this subchapter in the event of an emergency. The master of the tank vessel shall report to the Clearing House any deviation from the requirements outlined in this subchapter as soon as practicable, and in no case later than the departure of the tank vessel from the marine waters of the state. For purposes of this section, an emergency shall include, but not be limited to, any of the following:

(1) imminent and immediate danger to the vessel, its cargo, or its crew; or

(2) imminent and immediate danger to a marine terminal, or to the escort tug; or

(3) imminent and immediate danger to a vessel in close proximity to the tank vessel; or

(4) any emergency declared by the Captain of the Port.

(d) This subchapter (except for this Subsection 851.4(d)) shall not apply to tankers with double hulls, as that term is defined in 33 CFR 157.03(kk), when the tanker also has the following:

(1) Fully redundant steering and propulsion systems to include:

(A) two independent propulsion systems each with a dedicated propeller, engine (or motor), electrical generation system, electrical system (including the switchboard), fuel system, lube oil system, and any other system required to provide the vessel with independent means of propulsion; and

(B) two independent rudders each with separate steering systems; and

(C) the propulsion and steering components, as described in Subsection (A) and (B) above, shall be arranged in separate spaces, such that a fire or flood in one space will not affect the equivalent system in the other space(s); and

(D) a bow thruster with an assigned power source;

(2) A Navigation System in compliance with the federal navigational equipment requirements set forth in 33 CFR Sections 164.35, 164.37, 164.38(b), 164.40, 164.41, 164.42, and 164.43.

(3) No exemption to this subchapter shall be allowed for a tanker requesting a U.S. Coast Guard Captain of the Port letter of deviation, pursuant to 33 CFR Sections 164.51, 164.53, and 164.55.

(4) The Administrator may require tankers that are exempt from this subchapter under the conditions outlined in Subsection (d) to periodically demonstrate the tanker and crews ability to maneuver in response to a partial or total loss of propulsion and/or steering at a level of safety at least equal to that of an escorted tanker.

(e) This subchapter shall apply to all tugs being used to escort tank vessels in waters identified as escort zones.

(f) The tank vessel master remains responsible for the safe navigation and maneuvering of the vessel in all circumstances. The requirements outlined in this section are in addition to, and not a limitation of, any other responsibility created by custom, law, or regulation.



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