DEPARTMENT OF ECOLOGY
State of Washington

Crude Oil Movement by Rail and Pipeline

Quarterly Report: April 1, 2021, through June 30, 2021

July 2021
Publication 21-08-015

Publication and Contact Information

This report is available on the Department of Ecology's website at
https:/apps.ecology.wa.gov/publications/SummaryPages/2108015.html

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Spill Prevention, Preparedness, and Response Program
Washington State Department of Ecology
Olympia, Washington

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Introduction

To enhance crude oil spill preparedness and response in Washington State, on August 24, 2016, Ecology adopted the rule, Oil Movement by Rail and Pipeline Notification. The rule establishes reporting standards for facilities that receive crude oil by rail and pipelines that transport crude oil in or through the state.[1] Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public.

This rule is the result of 2015 Legislative direction to provide a better understanding of the changing risk picture for crude oil transported in Washington State as a result of the introduction of crude oil transport by rail, and the associated changes in both the volume and properties of crude moving through Washington.

Timely notice of oil movement information is necessary for emergency responders and planners to effectively prepare for and respond to oil spills and other incidents associated with transporting crude oil by rail and pipeline. Providing adequate information about the dates, routes, and properties of crude oil can help protect people living and working near railroads and pipelines, the economy, and environmental resources of Washington State.

Ecology is required to publish information collected under the rule to its website on a quarterly basis. The quarterly reports provide:

- Aggregated information on crude oil transported by rail to facilities in Washington.
- Information about crude oil movement by pipeline in or through the state.
- Reported spills during transport and delivery of crude by rail and pipeline.
- Volume of crude oil transported by vessel.

The reports are intended to inform the public about the nature of crude oil movement through their communities.

The reporting period for this quarterly report is April 1, 2021, through June 30, 2021.

[1] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil by Rail Summary

Movement of crude oil by rail in Washington State began in 2012 and has continued to increase since that time. Rail routes transporting crude oil enter the state from Idaho near Spokane and from British Columbia near Bellingham, and Ecology continues to monitor other potential routes. Large segments of the rail routes travel along the I-5 corridor, and cross or run next to major waterways, including the Columbia River and Puget Sound. (See Appendix A for a map of railroad routes in the state.)

Capturing information on the properties of crude oil, the volume transported, and the routes used to transport it allows for proper planning, placement of resources, and opportunities to provide detailed information to responders in the event of a spill, ensuring a more effective overall response. The rule directs Ecology to gather this information by requiring facilities receiving crude oil by rail to report all scheduled crude oil deliveries to be received by the facility each week for the succeeding seven-day period. Facilities enter this information into Ecology's Advance Notice of Transfer (ANT) database.

Information reported by facilities on scheduled crude oil deliveries includes the region of origin of crude oil, the railroad route taken to the facility within the state (if known), scheduled time and volume in barrels (bbls) of the delivery, and the gravity, sulfur content, and vapor pressure of the oil. Ecology uses the standard American Petroleum Institute (API) gravity ranges to define the crude type in the ANT database. (See Appendix B for the API gravity and sulfur content definitions and crude type ranges.)

Ecology is required to aggregate the information provided on a statewide basis by route, week, and type of crude oil. Aggregate information from the ANT database is provided in Table 1 for the period April 1, 2021, through June 30, 2021, representing the 2nd Quarter of 2021. Each week is numbered by calendar week and is aggregated by route and type of crude. The information provided includes:

- Total weekly volume in barrels (bbls) of crude oil transported by rail
- Route
- Region of origin
- Crude type (combining API gravity range and sulfur content)
- Route volume
- Estimated number of railcars per route delivering crude oil (assumes each car holds 680 bbls)

Fourteen calendar weeks are reported in the 2nd Quarter of 2021 starting at calendar week 14 and ending at calendar week 27.

Table 1: Crude oil movement by rail

Calendar week 14

Week 14 consists of only three days of reported ANT volumes due to the dates of the reporting period.

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	137,659	202
1A, 2, 3, 4	North Dakota	Light Sweet Crude	66,133	97
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	211,181	310
1B, 2, 3	Alberta	Heavy Sour Crude	59,643	87
Weekly totals			**474,616**	**696**

Calendar week 15

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	70,962	104
1A, 2, 3, 4	North Dakota	Light Sweet Crude	405,590	596
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	639,376	940
1B, 2, 3	Alberta	Heavy Sour Crude	124,578	183
Weekly totals			**1,240,506**	**1,823**

Calendar week 16

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	276,386	406
1A, 2, 3, 4	North Dakota	Light Sweet Crude	396,968	583
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	426,646	627
1B, 2, 3	Alberta	Heavy Sour Crude	63,079	92
5	Alberta	Light Sweet Crude	66,956	98
Weekly totals			**1,230,035**	**1,806**

Calendar week 17

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	135,599	199
1A, 2, 3, 4	North Dakota	Light Sweet Crude	138,152	203
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	567,742	834
1B, 2, 3	Alberta	Heavy Sour Crude	122,943	180
5	Alberta	Light Sweet Crude	67,460	99
Weekly totals			**1,031,896**	**1,515**

Calendar week 18

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	138,311	203
1A, 2, 3, 4	North Dakota	Light Sweet Crude	140,954	207
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	216,009	317
1B, 2, 3	Alberta	Heavy Sour Crude	124,465	183
5	Alberta	Light Sweet Crude	198,263	291
Weekly totals			**818,002**	**1,201**

Calendar week 19

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	274,054	403
1A, 2, 3, 4	North Dakota	Light Sweet Crude	209,066	307
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	572,118	841
1B, 2, 3	Alberta	Heavy Sour Crude	124,981	183
5	Alberta	Light Sweet Crude	199,540	293
Weekly totals			**1,379,759**	**2,027**

Calendar week 20

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	68,929	101
1A, 2, 3, 4	North Dakota	Light Sweet Crude	281,404	413
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	349,665	514
1B, 2, 3	Alberta	Heavy Sour Crude	124,857	183
5	Alberta	Light Sweet Crude	134,428	197
Weekly totals			**959,283**	**1,408**

Calendar week 21

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	209,314	307
1A, 2, 3, 4	North Dakota	Light Sweet Crude	70,000	102
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	281,795	414
1B, 2, 3	Alberta	Heavy Sour Crude	123,329	181
5	Alberta	Light Sweet Crude	134,756	198
Weekly totals			**819,194**	**1,202**

Calendar week 22

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	209,944	308
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	565,330	831
1B, 2, 3	Alberta	Heavy Sour Crude	124,941	183
5	Alberta	Light Sweet Crude	201,007	295
Weekly totals			**1,101,222**	**1,617**

Calendar week 23

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	138,716	203
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	494,622	727
1B, 2, 3	Alberta	Heavy Sour Crude	63,276	93
5	Alberta	Light Sweet Crude	66,472	97
Weekly totals			**763,086**	**1,120**

Calendar week 24

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	209,052	307
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	563,223	828
1B, 2, 3	Alberta	Heavy Sour Crude	61,633	90
5	Alberta	Light Sweet Crude	66,434	97
Weekly totals			**900,342**	**1,322**

Calendar week 25

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	206,728	304
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	351,381	516
1B, 2, 3	Alberta	Heavy Sour Crude	124,778	183
5	Alberta	Light Sweet Crude	67,057	98
Weekly totals			**749,944**	**1,101**

Calendar week 26

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	350,673	515
1B, 2, 3	Alberta	Heavy Sour Crude	124,942	183
5	Alberta	Light Sweet Crude	133,296	196
Weekly totals			**608,911**	**894**

Calendar week 27
Week 27 consists of only four days of reported ANT volumes due to the dates of the reporting period.

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	208,420	306
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	142,119	208
5	Alberta	Light Sweet Crude	66,800	98
Weekly totals			**417,339**	**612**

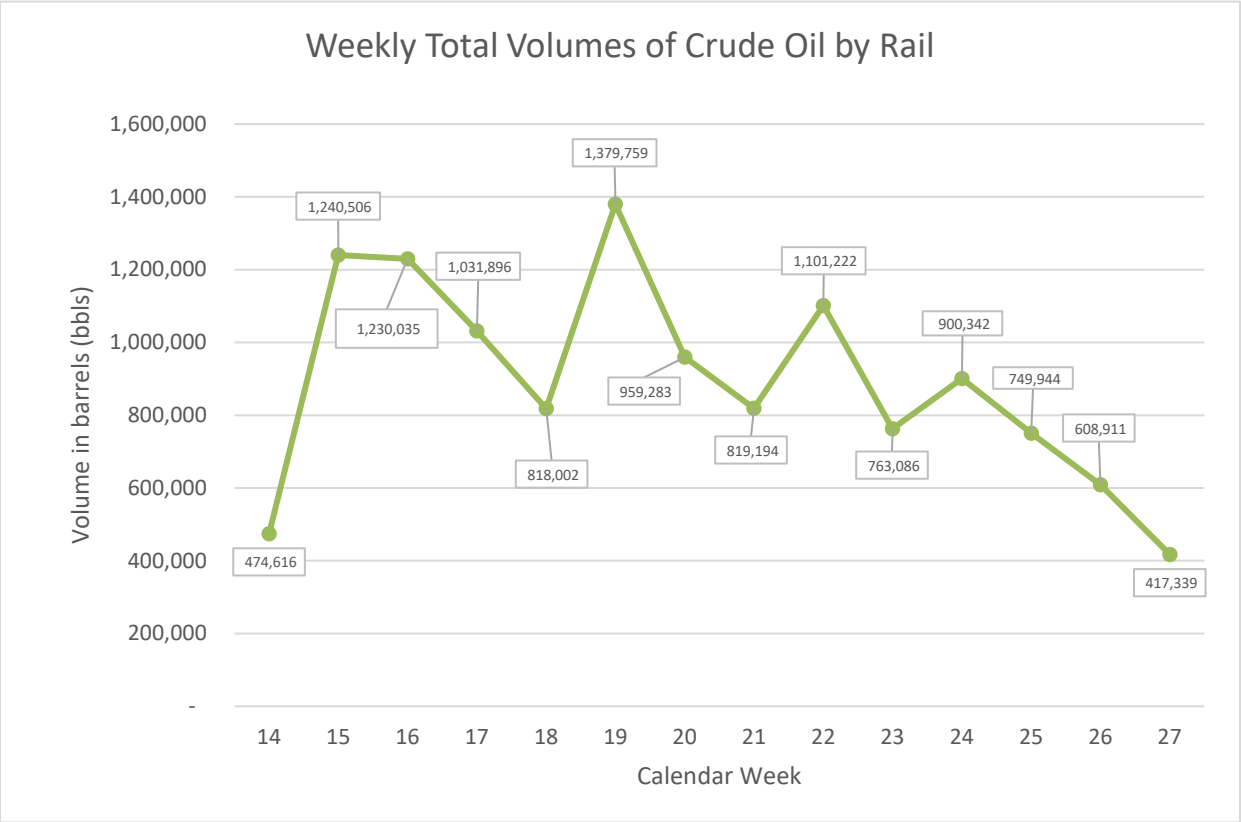
Note: *The data provided in Table 1 was reported to Ecology by the receiving facility into the ANT database as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

2021 Quarter 2 total volume (bbls): 12,494,135

A summary of the data shows:

- Two regions of origin were reported: North Dakota and Alberta.
- Two types of crude oil were reported: heavy and light.
- Routes 1A, 1B, and 2 through 5 were used to transport crude by rail.
- The total volume of crude oil transported by rail during the quarter was 12,494,135 barrels (524,753,670 gallons).
- The average weekly volume of crude oil transported by rail was 961,087 barrels (40,365,667 gallons).
- The total number of rail cars moving crude oil by rail was 18,344 cars.
- The average number of rail cars per week moving crude oil by rail was 1,411 cars.
- 89.06 percent of crude oil transported by rail was light crude.
  10.94 percent of crude rail transported by rail was heavy crude.
- 89.06 percent of crude oil transported by rail was sweet crude.
  10.94 percent of crude oil transported by rail was sour crude.
- North Dakota was the region of origin for 77.83 percent of crude oil transported by rail.
  Alberta was the region of origin for 22.17 percent of crude oil transported by rail.
- Crude oil originating in North Dakota had reported vapor pressure ranging from 4.2 to 11.8 pounds per square inch.
  Crude oil originating in Alberta had reported vapor pressure ranging from 9.0 to 12.6 pounds per square inch.

Figure 1 shows the weekly total volumes of crude transported by rail for each calendar week in the 2nd Quarter of 2021.



Note: *Week 14 consists of only 3 days of reported ANT volumes due to the dates of the reporting period. Week 27 consists of only 4 days of reported ANT volumes due to the dates of the reporting period.*

Figure 1: Weekly total volumes of crude oil by rail for the 2nd Quarter of 2021

The lowest weekly volume was 608,911 barrels (25,574,262 gallons) in Week 26. The highest weekly volume of crude transported by rail was 1,379,759 barrels (57949878 gallons) in Week 19.

Figure 2 displays crude transported by rail, by route, for the 2nd Quarter of 2021.

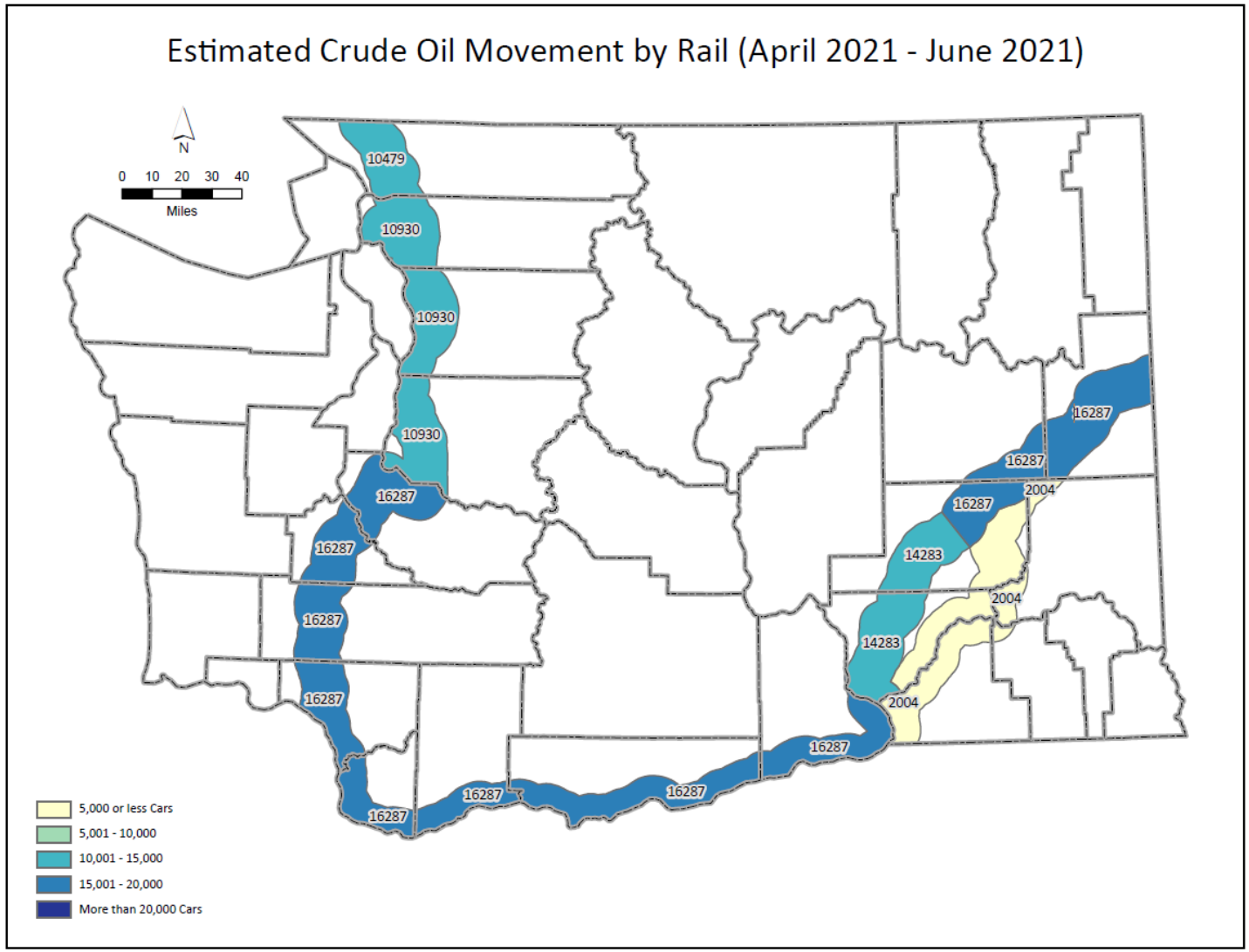


Figure 2: Crude oil movement by route for the 2nd Quarter of 2021

Crude Oil by Pipeline Summary

Pipelines exist inland and may be located near waterbodies and populated areas. Knowing the types and quantities of crude oil transported through pipelines in Washington State helps Ecology properly plan for and execute a rapid, aggressive, and well-coordinated response to a spill.

Under the rule, transmission pipelines that transport crude oil in or through the state must provide Ecology biannual notice of all crude oil transported in or through the state.[2] Biannual notice must be submitted each year by July 31 for the period from January 1 through June 30, and by January 31 for the period from July 1 through December 31. Biannual notice provided by pipelines includes contact information for the pipeline and the total volume of crude oil transported in or through the state during the reporting period by state or province of origin.

The most recent biannual notices from pipelines covered the period from January 1, 2021, through June 30, 2021. Table 2 below provides the total volume of crude oil transported in or through the state by pipelines during this period.

Table 2: Crude oil movement by pipeline

Period	State/Province of Origin	Mean API Gravity & Range	Sulfur Content	Volume (bbls)
January 1, 2021 – June 30, 2021	Alberta	36.1 (Light)	Sweet (≤0.5%)	24,050,454
January 1, 2021 – June 30, 2021	Alberta	38.5 (Light)	Sour (>0.5%)	8,744,370

Note: *The data provided in Table 2 was reported to Ecology by the pipelines transporting crude oil in or through the state, as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

The next biannual notices from pipelines will cover the period from July 1, 2021, through December 31, 2021, and must be submitted to Ecology by January 31, 2022.

Crude Oil Spills – Rail and Pipeline

Oil spills can have significant impacts to the public, environment, and economy. Ecology strives to protect Washington's environment, economy, and public health and safety through a comprehensive spill prevention, preparedness, and response program.

The rule directs Ecology to provide the number and volume of spills to the waters of the state during the transport and delivery of crude oil by rail and pipeline in each quarterly report.[3] For the period of April 1, 2021, through June 30, 2021, zero crude oil spills to the environment by rail or pipeline were reported. In the event there are spills to report in the future, Ecology will provide this information and include the date of the spill, the county where the spill occurred, the source, material, and volume of the spill.

[2] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification
[3] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil Movement by Vessel

In 2006, the state adopted rules for advance notice of oil transfers for vessels and facilities. Ecology has been receiving advance notice of transfer data for all transfers to or from vessels in Washington State since that time.

In order to provide a full picture of crude oil movement in Washington State, a summary of crude oil movement by vessel is provided below, which is in addition to the requirement for this quarterly report as described in the rule.[4]

Table 3, below, provides the total volume of crude oil in barrels of inbound and outbound vessel transfers for the period of April 1, 2021, through June 30, 2021. Inbound vessel transfers refers to crude oil movement from vessels to facilities, while outbound vessel transfers refers to crude oil movement from facilities to vessels.

Table 3: Crude oil movement by vessel

Vessel transfers	Volume (bbls)	Volume (gallons)
Inbound	19,486,517	818,433,714
Outbound	38,000	1,596,000
Total	**19,524,517**	**820,029,714**

Note: *The data provided in Table 3 was reported to Ecology into the ANT database as required by Chapter 173-180 WAC and Chapter 173-184 WAC. Ecology cannot confirm the data or verify its accuracy.*

A summary of vessel transfer data for the quarter shows:

- There were 46 total vessel transfers of crude oil (inbound or outbound).
- The average volume of crude oil transferred to or from vessels per week was 1,501,886 barrels (63,079,209 gallons).

[4] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

An Overview of Crude Oil Movement in Washington

A broad view of crude oil movement in Washington State can be seen when comparing the movement of crude oil transported into the state by vessel, rail, and pipeline.

Figure 3 shows the estimated percentage of crude oil transported by vessel (inbound only), rail, and pipeline for the last four quarters, covering the period of July 1, 2020, through June 30, 2021.[5]

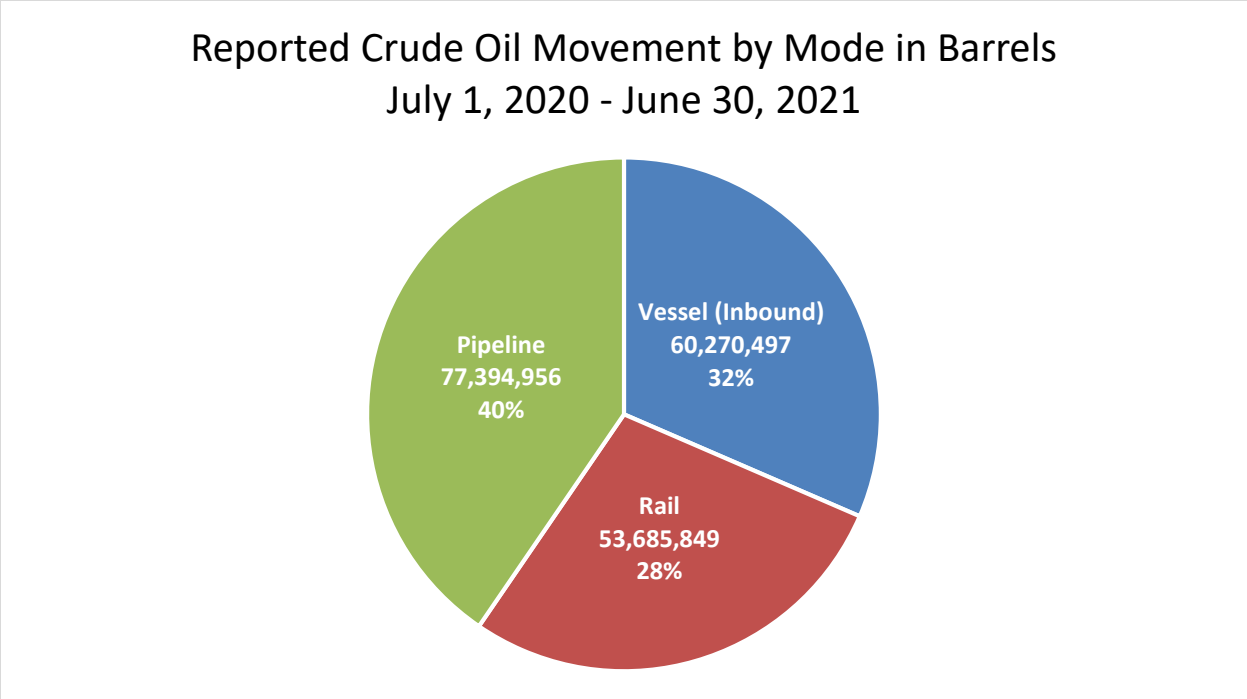
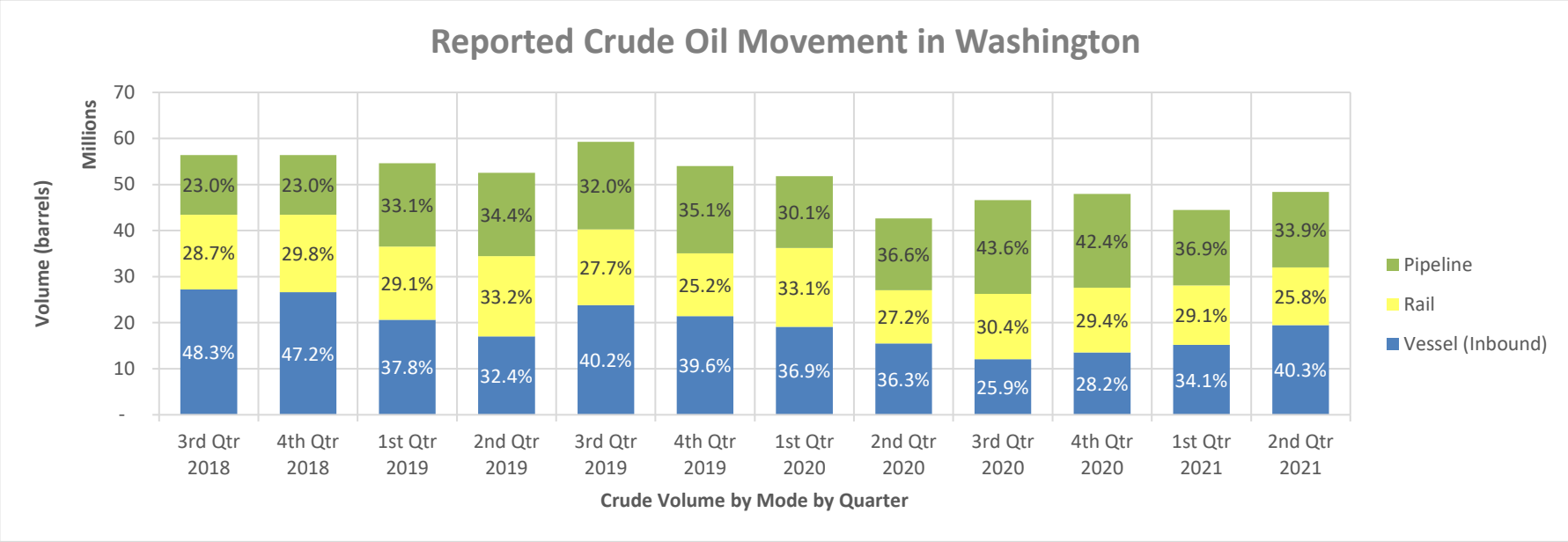


Figure 3: 12-month crude oil movement by mode

Between July 1, 2020, and June 30, 2021, vessels were responsible for 32 percent of reported crude oil movement into the state, rail was responsible for 28 percent, and pipeline for 40 percent.

[5] The most recent biannual notices from pipelines were submitted to Ecology for the period from January 1, 2021 through June 30, 2021. The next biannual notices submitted by pipelines will cover the period from July 1, 2021 through December 31, 2021, and must be submitted to Ecology by January 31, 2022.

Figure 4 shows crude oil movement, by mode, covering the period of July 1, 2018, through June 30, 2021.



Mode	3rd Qtr 2018	4th Qtr 2018	1st Qtr 2019	2nd Qtr 2019	3rd Qtr 2019	4th Qtr 2019	1st Qtr 2020	2nd Qtr 2020	3rd Qtr 2020	4th Qtr 2020	1st Qtr 2021
Vessel (Inbound)	48.3%	47.2%	37.8%	32.4%	40.2%	39.6%	36.9%	36.3%	25.9%	28.2%	34.1%
Rail	28.7%	29.8%	29.1%	33.2%	27.7%	25.2%	33.1%	27.2%	30.4%	29.4%	29.1%
Pipeline	23.0%	23.0%	33.1%	34.4%	32.0%	35.1%	30.1%	36.6%	43.6%	42.4%	36.9%

Figure 4: Quarterly crude oil movement by mode, July 2018 – June 2021

Ecology will continue to receive information about crude oil movement and use the data to summarize changes over time.

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Appendix A – Washington Railroad Routes

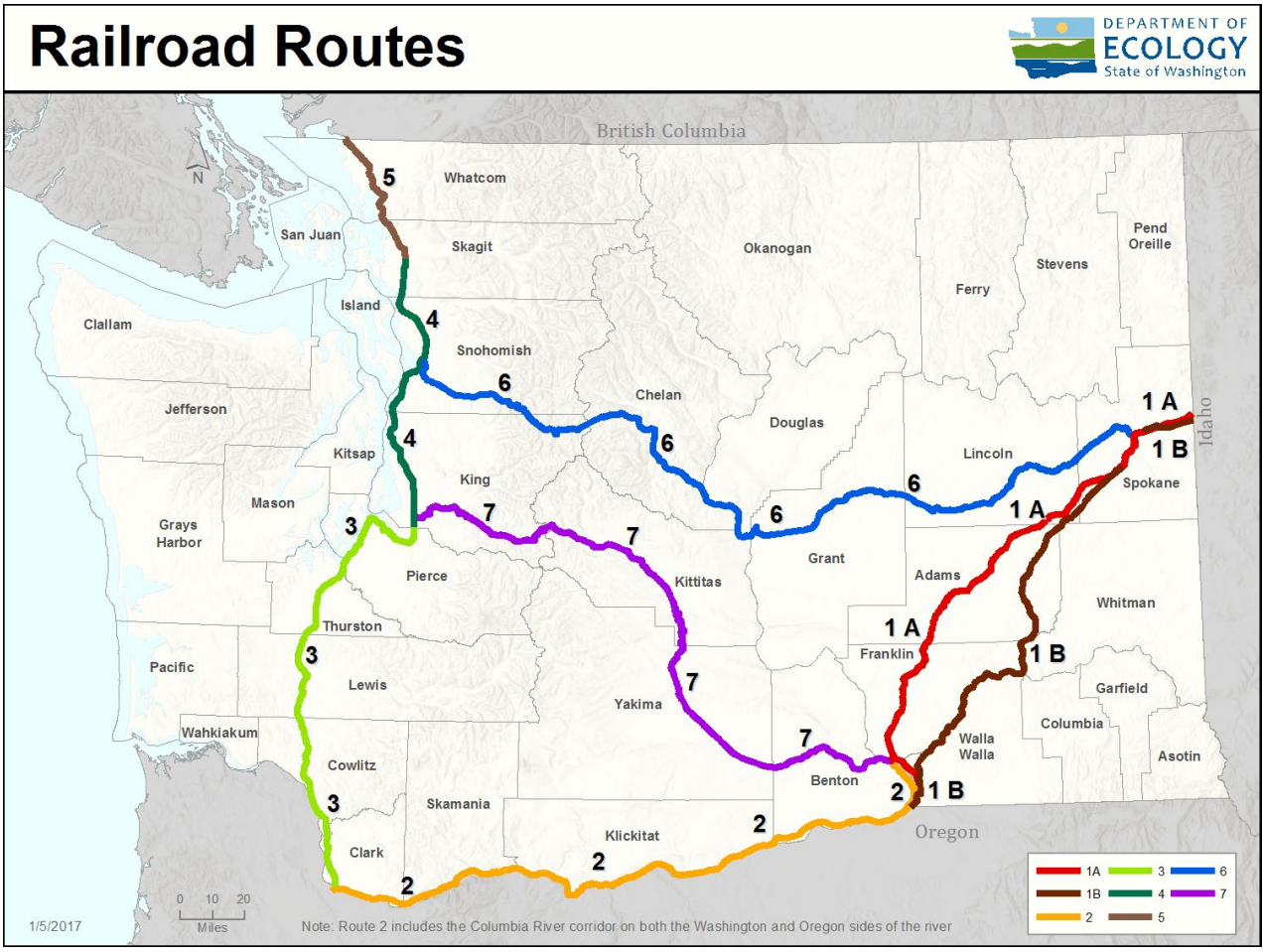

Figure 5: Railroad routes in Washington

Appendix B – API Gravity and Crude Oil Types

Information reported by facilities on scheduled crude oil deliveries includes the gravity and sulfur content of the oil. Ecology uses the standard American Petroleum Institute gravity (API gravity) ranges in combination with the sulfur content to define the crude type in the ANT database.

Sulfur content is measured as the percent of sulfur, by weight, of the crude oil. Oil is categorized by its sulfur content as either sweet or sour. Sour crudes contain greater than 0.5% sulfur. Sweet crudes have less than or equal to 0.5% sulfur.

API gravity is the measure of the density of petroleum liquid in relation to the density of water and is used to classify oils as light, medium, heavy, and extra heavy. The lower the API gravity, the more likely it is to sink in water. Crude type by API gravity is shown in the table below.

Table 4: Crude type by API gravity

Crude Type	API Gravity Range
Light Crude	31.2-50 API
Medium Crude	22.3-31.1 API
Heavy Crude	10-22.2 API
Extra Heavy Crude	0-9.9 API