DEPARTMENT OF ECOLOGY
State of Washington

Crude Oil Movement by Rail and Pipeline

Quarterly Report: July 1, 2021, through September 30, 2021

October 2021
Publication 21-08-018

Publication and Contact Information

This report is available on the Department of Ecology's website at
https:/apps.ecology.wa.gov/publications/SummaryPages/2108018.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 July 1, 2021, through September 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 July 1, 2021, through September 30, 2021, representing the 3rd 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 3rd Quarter of 2021 starting at calendar week 27 and ending at calendar week 40.

Table 1: Crude oil movement by rail

Calendar week 27

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	68,900	101
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	209,052	307
1B, 2, 3	Alberta	Heavy Sour Crude	62,636	92
Weekly totals			**340,588**	**500**

Calendar week 28

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	208,735	306
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	355,575	522
1B, 2, 3	Alberta	Heavy Sour Crude	61,735	90
Weekly totals			**626,045**	**918**

Calendar week 29

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	68,744	101
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	557,251	819
1B, 2, 3	Alberta	Heavy Sour Crude	184,603	271
Weekly totals			**810,598**	**1,191**

Calendar week 30

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	205,651	302
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	422,059	620
1B, 2, 3	Alberta	Heavy Sour Crude	122,078	179
5	Alberta	Light Sweet Crude	133,139	195
Weekly totals			**882,927**	**1,296**

Calendar week 31

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	205,823	302
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	707,367	1,040
1B, 2, 3	Alberta	Heavy Sour Crude	61,571	90
5	Alberta	Light Sweet Crude	66,931	98
Weekly totals			**1,041,692**	**1,530**

Calendar week 32

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	208,851	307
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	354,909	521
1B, 2, 3	Alberta	Heavy Sour Crude	124,161	182
5	Alberta	Light Sweet Crude	133,142	195
Weekly totals			**821,063**	**1,205**

Calendar week 33

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	139,958	205
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	424,855	624
1B, 2, 3	Alberta	Heavy Sour Crude	121,811	179
5	Alberta	Light Sweet Crude	199,456	293
Weekly totals			**886,080**	**1,301**

Calendar week 34

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	274,983	404
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	494,569	727
1B, 2, 3	Alberta	Heavy Sour Crude	61,459	90
5	Alberta	Light Sweet Crude	197,716	290
Weekly totals			**1,028,727**	**1,511**

Calendar week 35

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	137,889	202
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	430,191	632
1B, 2, 3	Alberta	Heavy Sour Crude	62,429	91
5	Alberta	Light Sweet Crude	264,167	388
Weekly totals			**894,676**	**1,313**

Calendar week 36

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	139,423	205
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	497,114	731
1B, 2, 3	Alberta	Heavy Sour Crude	123,920	182
5	Alberta	Light Sweet Crude	200,254	294
Weekly totals			**960,711**	**1,412**

Calendar week 37

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	139,956	205
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	499,073	733
1B, 2, 3	Alberta	Heavy Sour Crude	124,068	182
5	Alberta	Light Sweet Crude	130,061	191
Weekly totals			**893,158**	**1,311**

Calendar week 38

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	208,514	306
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	356,239	523
1B, 2, 3	Alberta	Heavy Sour Crude	61,593	90
5	Alberta	Light Sweet Crude	127,682	187
Weekly totals			**754,028**	**1,106**

Calendar week 39

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Sweet Crude	139,244	204
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	502,832	739
1B, 2, 3	Alberta	Heavy Sour Crude	62,617	92
5	Alberta	Light Sweet Crude	63,590	93
Weekly totals			**768,283**	**1,128**

Calendar week 40

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	138,252	203
1A, 2, 3, 4, 5	North Dakota	Light Sweet Crude	142,376	209
1B, 2, 3	Alberta	Heavy Sour Crude	61,818	90
5	Alberta	Light Sweet Crude	63,382	93
Weekly totals			**405,828**	**595**

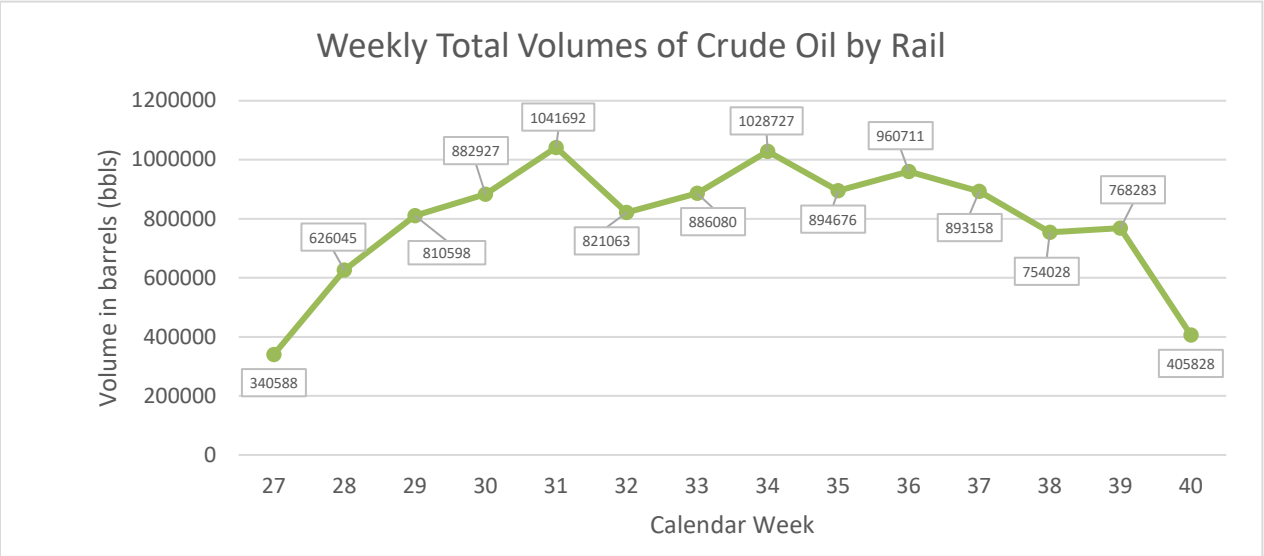
Note: *The data provided in Table 1 was reported to Ecology by the receiving facility into the ANT database as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

2021 Quarter 3 total volume (bbls): 11,114,404

A summary of the data shows:

- Two regions of origin were reported: North Dakota and Alberta.
- Two types of crude oil were reported: light and heavy.
- 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 11,114,404 barrels (466,804,968 gallons).
- The average weekly volume of crude oil transported by rail was 845,661 barrels (35,517,769 gallons).
- The total number of rail cars moving crude oil by rail was 16,317 cars.
- The average number of rail cars per week moving crude oil by rail was 1,242 cars.
- 88.33 percent of crude oil transported by rail was light crude.
  11.67 percent of crude rail transported by rail was heavy crude.
- 88.33 percent of crude oil transported by rail was sweet crude.
  11.67 percent of crude oil transported by rail was sour crude.
- North Dakota was the region of origin for 74.12 percent of crude oil transported by rail.
  Alberta was the region of origin for 25.88 percent of crude oil transported by rail.
- Crude oil originating in North Dakota had reported vapor pressure ranging from 4.5 to 10.3 pounds per square inch.
  Crude oil originating in Alberta had reported vapor pressure ranging from 6.3 to 11.6 pounds per square inch.

Figure 1 shows the weekly total volumes of crude transported by rail for each calendar week in the 3rd Quarter of 2021.



Note: *Week 27 consists of only 3 days of reported ANT volumes due to the dates of the reporting period. Week 40 consists of only 5 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 3rd Quarter of 2021

The lowest weekly volume was 754,028 barrels (31,669,176 gallons) in Week 38. The highest weekly volume of crude transported by rail was 1,041,692 barrels (43,751,064 gallons) in Week 31.

Figure 2 displays crude transported by rail, by route, for the 3rd Quarter of 2021.

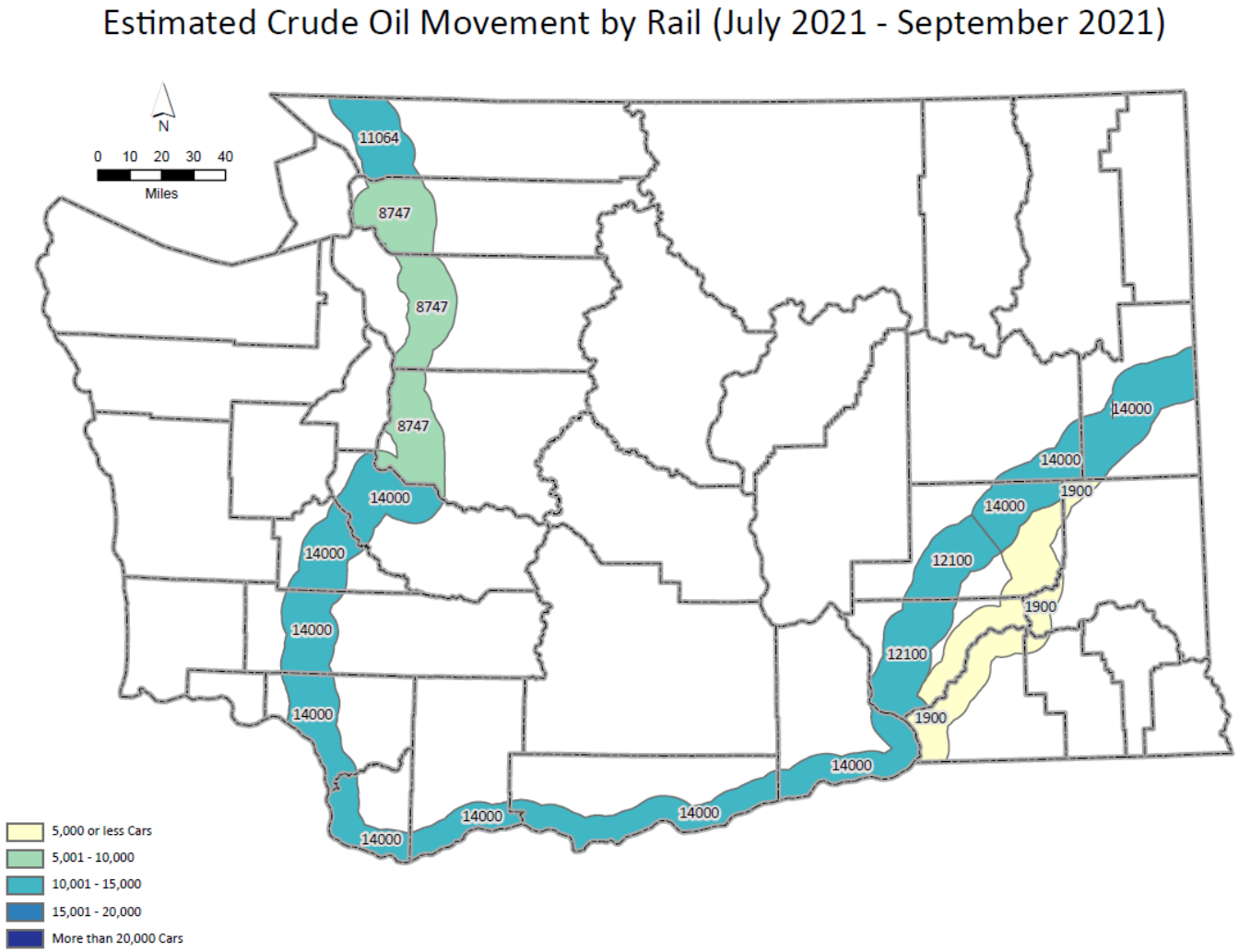


Figure 2: Crude oil movement by route for the 3rd Quarter of 2021

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 July 1, 2021, through September 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 July 1, 2021, through September 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	27,975,911	1,174,988,247
Outbound	118,000	4,956,000
Total	**28,093,911**	**1,179,944,247**

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 69 total vessel transfers of crude oil (inbound or outbound).
- The average volume of crude oil transferred to or from vessels per week was 2,137,580 barrels (89,778,367 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 October 1, 2020, through September 30, 2021.[5]

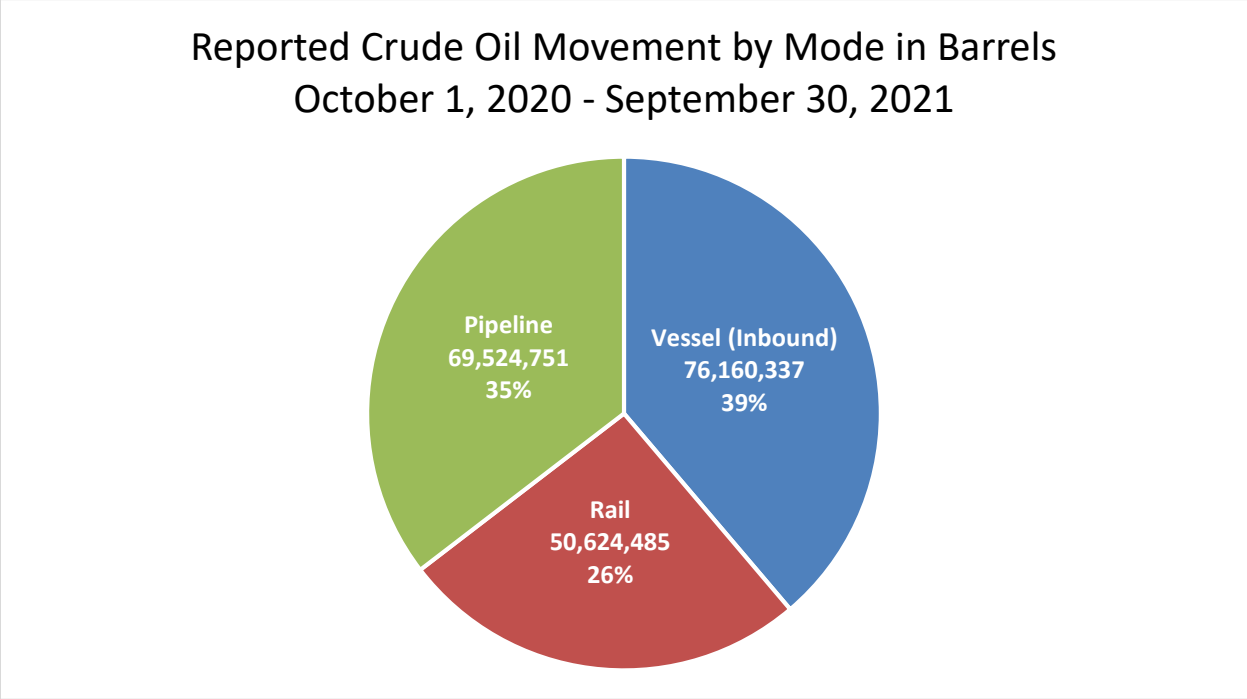
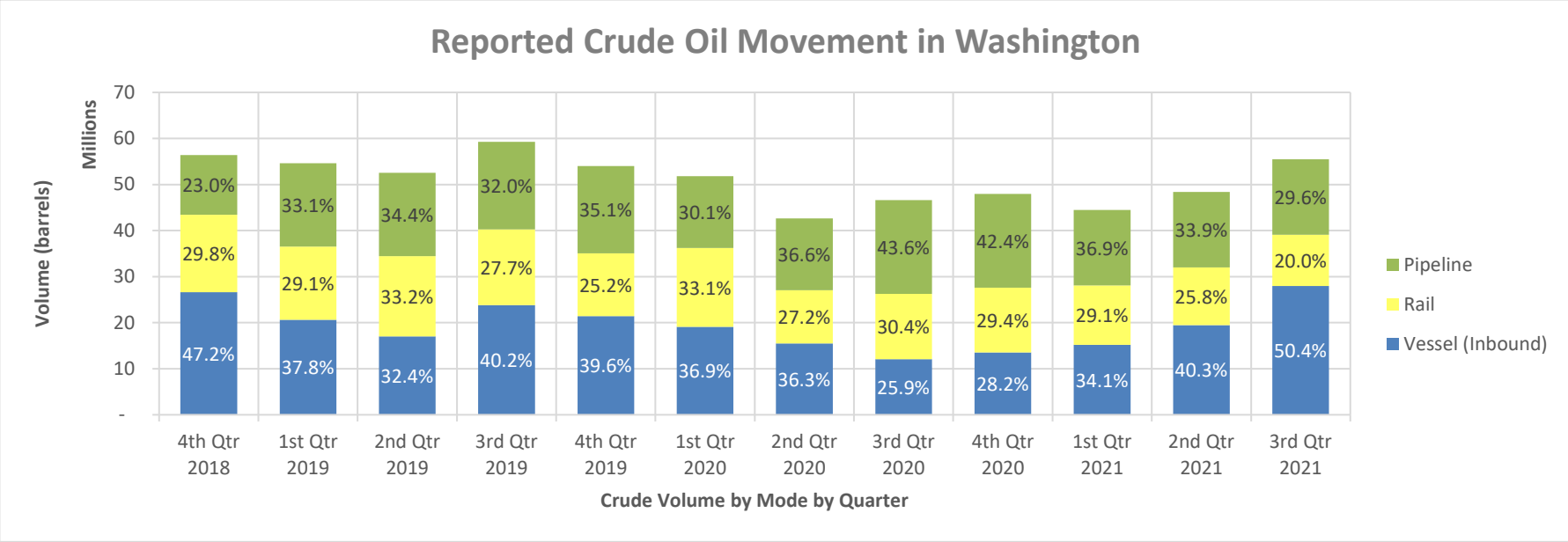


Figure 3: 12-month crude oil movement by mode

Between October 1, 2020, and September 30, 2021, vessels were responsible for 39 percent of reported crude oil movement into the state, rail was responsible for 26 percent, and pipeline for 35 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 October 1, 2018, through September 30, 2021.



Mode	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	2nd Qtr 2021	3rd 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%	40.3%
Rail	28.7%	29.8%	29.1%	33.2%	27.7%	25.2%	33.1%	27.2%	30.4%	29.4%	29.1%	25.8%
Pipeline	23.0%	23.0%	33.1%	34.4%	32.0%	35.1%	30.1%	36.6%	43.6%	42.4%	36.9%	33.9%

**Note*: *The most recent biannual notices from pipelines were submitted to Ecology for the period from January 1, 2021, through June 30, 2021. For more recent quarters, Ecology estimated crude oil movement by pipeline for the period based on data provided in that previous biannual notice.*

Figure 4: Quarterly crude oil movement by mode, October 2018 – September 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

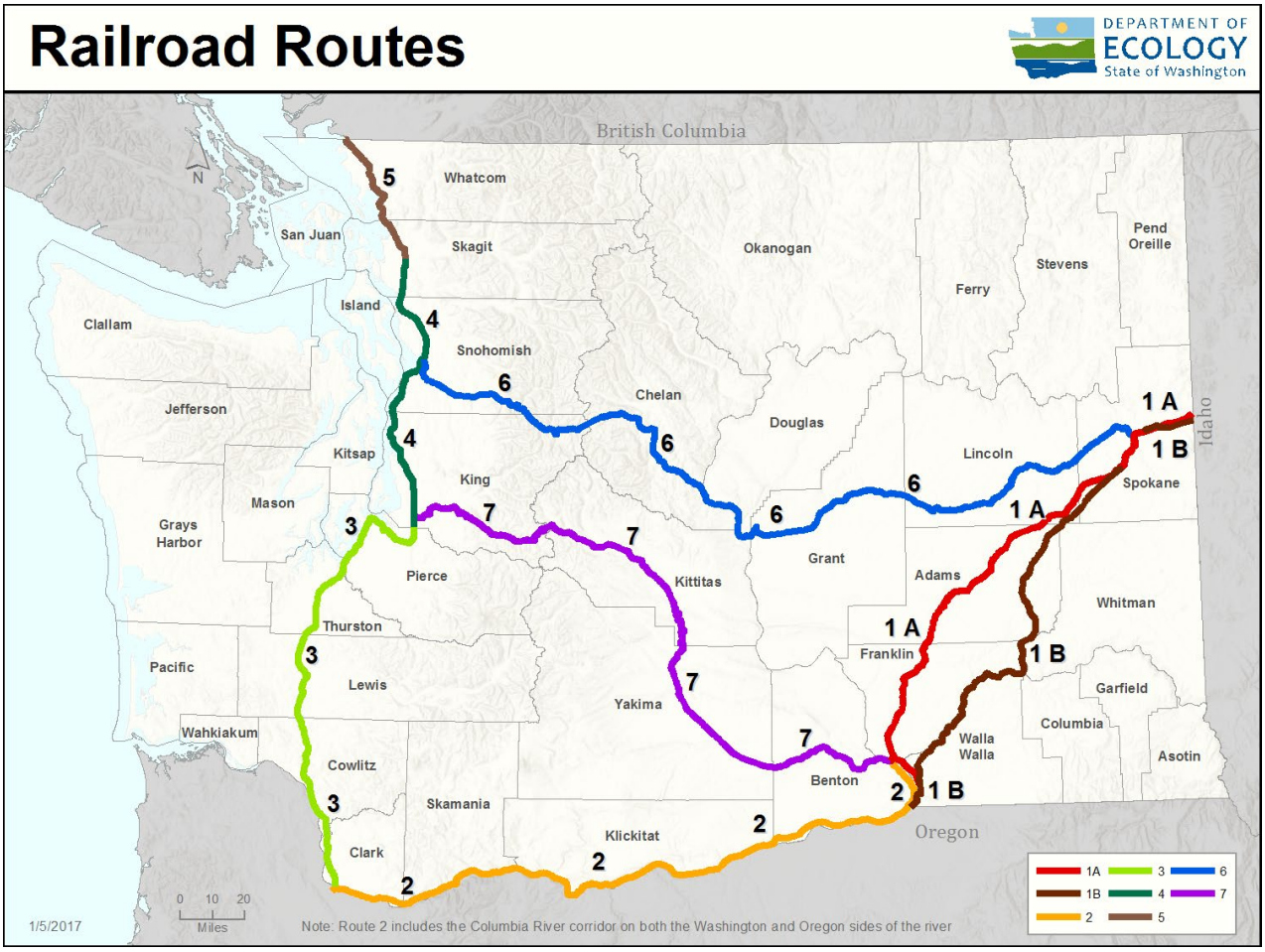

Figure 5: Railroad routes in Washington

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 percent sulfur. Sweet crudes have less than or equal to 0.5 percent 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